Anaphora, meaning and representation.

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Anaphora, Meaning and Representation

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To Marisa, Daniel, Esteban and Ignacio with love

Abstract

Decisive advances in semantics have taken place in the past two decades as a consequence of studying quantificational and referential mechanisms associated with anaphora and, in particular, with unbound and so-called "donkey" anaphora. In this context, S. Neale's proposal represents a remarkable philosophical and semantic refinement of the E-Type theory advanced by G. Evans several years ago. According to the Evans-Neale view, donkey pronouns represent or go proxy for definite descriptions. This view also implies, in accordance with P. Geach's analysis, that donkey sentences always possess a univocal meaning provided by their literal truth-conditions. The main concern of this thesis is to explore and evaluate the semantic and pragmatic consequences that follow from, on the one hand, assuming an E-type theory and, on the other hand, abandoning Geach's analysis in terms of univocal truth-conditions. We argue that, in that scenario, a treatment of donkey sentences in terms of nonspecificity becomes inevitable. In particular (on empirical and theoretical grounds) we claim that treatments based on ambiguity are bound to fail. In order to support our claims about nonspecificity three main lines of argument are developed. The first line concerns the nature of the nonspecificity involved in donkey sentences. We claim that donkey pronouns can be referentially interpreted and, under that interpretation, they generate, in a similar way as definite descriptions do, referential nonspecificity. Resolution of that nonspecificity presupposes, we argue, the application of several pragmatic mechanisms and distinctions based on P. Grice's views and other theorists. The second avenue of argument concerns the representation of nonspecific donkey sentences. We show that nonspecificity associated with donkey sentences can be represented by using mainly functional or parametric devices. As a consequence, we examine in detail the tenets supporting a functional conception of donkey anaphora. In this conception, pronouns denote choice functions satisfying a certain condition. Finally, the third line of argument has to do with the interpretation of the values of those functions. We suggest that these values can be interpreted and represented, from a cognitive and pragmatic point of view, as genuine nonspecific referents that speakers and hearers are committed to when processing discourse containing different referring expressions.

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Contents

CHAPTER I

INTRODUCTION : THE FOUNDATIONAL ISSUES

1.1 Scope and Aim

Anaphoric reference is perhaps one of the most pervasive feature of discourse in natural language and thereby deserves to be studied in its own right. A pronoun is said to refer anaphorically if it is used to refer to that which other expression—the 'antecedent phrase'—was used to refer to. The salient problem about anaphora, when the antecedent phrase is a quantified one, is how we are to explain the connection between the pronoun and the antecedent. Accordingly, most studies of anaphora have concentrated on explaining the nature of that connection. From a general point of view, the purpose of those studies has been to establish whether the anaphoric connection can be explained only in ***logical*** terms. It is very tempting for logicians and philosophers to think about anaphora as a phenomenon under the full control of logic, i.e. as exclusively determined by the form of the sentence or sentences that the pronoun is embedded in. Thus, the relation pronoun–antecedent would be submitted to the same logical principles and laws governing the construction of any quantified sentence. This treatment puts the axis of the anaphoric relation in the quantified antecedent rather than in the pronoun. Let us call this view, the ***quantificational*** tradition of anaphora in discourse. The quantificational tradition, originally defended by Quine (1960) and Geach (1962), has become the most influential one in the semantic field for the last three decades. The following remark by

Geach suggests the apparent dangers deriving from this tradition.

> The light this [the quantificational view] throws on the syntax of language will be seen more and more clearly by anyone who works out examples. For lack of this light, the medievals who discussed ***relativa***—pronouns with antecedents—were groping in the dark despite all their ingenuity. Let us consider how such puzzles as theirs arise.
>
> [(5)] Socrates owned a dog, and it bit Socrates.
>
> A medieval would treat this as a conjunctive proposition, and enquire after the reference (***suppositio***) of the pronoun "it"; I have seen modern discussions that made the same mistake. For mistake it is. (Geach 1972, p. 118)

Indeed, Geach's observation highlights the central significance that logicians and semanticists have attributed to the capacity in a theory of natural language to explain anaphora in discourse. The quantificational view can, in particular, be seen as implementing three general assumptions about the semantics of natural language anaphora: First, under normal circumstances of utterance, it allows us to assign truth-conditions univocally to the sentence or sentences bearing non-deictic anaphora. Second, this assignment needs not rely, in principle, on contextual or pragmatic factors. Third, pronouns always take univocal semantic values—basically individual objects—and these are determined by their antecedent in a way to be specified.

The first general aim of this dissertation is to show the inadequacy of the quantificational tradition, and to argue in favour of a different tradition, called the ***descriptive*** tradition. This is carried out in chapters one and three. The seeds of the descriptive tradition are to be found in Evans (1977), Parsons (1978) and Cooper (1979). They focused on a restricted kind of anaphoric phenomenon, the study of which will also restrict the focus and the scope of our own research. The handling of this kind of anaphora called, after work by Geach himself, 'donkey anaphora,' has persistently troubled theorists working on the quantificational view. This is because 'donkey pronouns' cannot be intuitively connected to their quantified antecedent via the logical form of the sentence they occur in. In the descriptive view, this problem simply does not arise since donkey pronouns are treated as going proxy for (presumably Russellian) definite descriptions whose content is mostly recovered from the antecedent. The axis of the anaphoric relation is, according to this view, the pronoun and not the quantified antecedent, as the quantificational tradition takes it. Evans states this contrast between the descriptive view and the quantificational view as follows:

> [...]philosophers have often suggested treating this or that pronoun in what amounts to a [descriptive] way. In so doing they have drawn upon themselves the vituperation of Professor Geach, who believes that any such proposal can be shown to involve a definite mistake. For example, Geach maintains that any analysis of the sentence
>
> [(13)] Socrates owns a dog and it bit Socrates
>
> as a conjunction of two propositions with a truth value would be 'inept'. Elsewhere the proposal is described as 'quite absurd', 'a prejudice or a blunder'. It is therefore with some trepidation that I confess to thinking that a conjunction of two propositions is precisely what [(13)] amounts to. (Evans 1977, in Evans 1985, p.112)

Several alternatives to deal with the problem of donkey anaphora within the boundaries of the quantificational tradition have been proposed. They can be divided into two types of solutions: the ***non-standard*** and the ***representational*** solutions. The non-standard solution, formulated by Groenendijk and Stokhof (1990, 1991), departs from the standard semantic and logical framework on which the quantificational tradition was established by Frege (1952, 1967) and later by Tarski (1956). In other words, the non-standard view introduces some important modifications in order to capture the anaphoric phenomena in question. In contrast, the representational solution, initiated by Kamp (1984) and Heim (1982), abandons the notion of logical form in the quantificational tradition and replaces it with a cognitively-motivated notion of discourse representation structure. Context-sensitivity considerations become, as a result, crucial in this solution. We shall argue that if the descriptive view is adequately extended and modified along the lines suggested by Cooper (1979), Evans (1985), and mainly Neale (1989, 1990), we need not abandon the standard logical framework. According to this view, the change takes place at the pragmatic level rather than at the level of logic. Furthermore, we will argue in chapter six that the modified descriptive approach can accommodate contextual information and freely incorporate, in its more elaborated form, representational structures in the Kamp-Heim sense.

The second general goal of our dissertation will be to suggest that donkey anaphora is a prominent example of linguistic non-univocality. This is carried out in chapters two and four. In other words, we hope to show that the explanatory success of any account of donkey (and unbound) anaphora depends on assuming that interpretation of donkey sentences is always underspecified by their conventional or grammatical meaning. This goal imposes, in its turn, two specific objectives. The first objective has to do with the truth-conditions normally associated with donkey sentences. As we saw, quantificational theorists assume (and so do also some members of the descriptive tradition) that the whole enterprise of producing a semantics for donkey sentences consists in fitting, in a given model, univocal and transparent truth-conditions—that apparently fix the content of such sentences—with semantic structures. On empirical and theoretical grounds, we will argue that this assumption is highly questionable. We suggest that the truth-conditions that we normally assign to donkey sentences exclusively on the basis of their syntactic or conventional features do not exhaust the meaning of those sentences. Such truth-conditions express just the ***external*** or literal meaning of donkey sentences. However, the utterance of these sentences are also amenable to express—when context-sensitive information is incorporated through special expressions or parameters and certain utterance circumstances obtain—other propositions or meanings and hence donkey sentences can be associated, in such utterance circumstances, with other truth-conditions. That is to say, the truth-conditions resulting of what is actually said in the utterance context plus the external or conventional meaning of the donkey sentence. Thus, instead of having a univocal and unique set of truth-conditions, we have more than one set of potential truth-conditions, whose disambiguation by hearers will be explained in terms of pragmatic and cognitive mechanisms. We take this lack of rigid and structurally-motivated truth-conditions as the methodological basis on which semantics of donkey sentences must be constructed.

If the non-univocality hypothesis is accepted all along, however, we have the problem of semantically clarifying the source of that crucial linguistic aspect. Solving this problem is the second objective deriving of this hypothesis. Two natural solutions suggest themselves. On the one hand, non-univocality of donkey sentences can be seen as a manifestation of genuine semantic ambiguity. Thus, if such sentences are assigned more than one set of truth-conditions, they will be associated with more than one structure generated at the relevant linguistic level. On the other hand, non-univocality of donkey sentences can also be seen as an expression of nonspecificity or indeterminacy. In this case, only one representation at the linguistic level will be needed to be associated with all the (preferred or non-preferred) interpretations or readings of these sentences. Under this sole representation, the different interpretations of donkey sentences cannot be conceived as completely separated from each other, at least regarding their logical form. Presumably, some factor in that form will be held responsible for the distinctive generation of each interpretation.

This dissertation aims at answering this dilemma created by the non-univocality of donkey sentences. We will argue that these sentences are semantically nonspecific in nature and show that only a nonspecificity hypothesis explains adequately why the conventional or grammatical meaning normally associated with those sentences underspecifies their final interpretation. We will also argue, in opposition to the second assumption supporting the quantificational view, that context and, in particular, background information shared by speakers and hearers, plays a central role in the determination of each interpretation of donkey sentences. In particular, we claim that disambiguation or resolution of the non-univocality of those sentences proceeds in a similar way to resolution of the non-univocality of sentences containing definite descriptions, in close accordance with arguments provided by Recanati (1993) and other theorists working on referring expressions along P. Grice's pragmatic lines. Thus, we see non-univocality of donkey sentences as a phenomenon emerging from the ***referential*** nonspecificity of the interpretation of the pronouns and being resolved according to general Gricean constraints. Also, we integrate our view of the nonspecificity deriving from donkey pronouns into a general view of ***semantic*** nonspecificity of the sentences, developed from M. Pinkal (1995)'s research.

In accordance with our statements above, and given that in the descriptive view the focus of the anaphoric relation is the pronoun, it follows that the focus of the postulated nonspecificity will likewise lie in the pronoun. Thus, a third goal of our dissertation will be to select an appropriate treatment that shows quite generally how pronouns themselves are the source of that nonspecificity. This concept is expanded upon in chapter five. We believe that some approaches to donkey anaphora originating from a well-established paradigm in quantifier theory—Generalized Quantifier theory—provide the required treatment. In order to fulfil this goal, we will adapt one of the approaches proposed by Lappin and Francez (1994). According to this treatment, donkey pronouns are represented at the semantic level as functions that satisfy certain conditions and are partially specified through contextual knowledge. We will argue that such a functional conception of donkey pronouns makes it clear how the set of potential interpretations of a donkey sentence can be specified out of a unique representation. Furthermore, as we shall see, Lappin and Francez's functional treatment is basically constructed on the same foundations as Neale's descriptive theory. This is, therefore, another reason for preferring their treatment.

Finally, the fourth goal of our thesis may well appear more controversial. It concerns the interpretation (and the representation) of the values of donkey functions. We propose to interpret, at the semantic level, the ***values*** denoted by such functions as nonspecific or, in general, as ***nonspecific referents*** (in fact, we will talk about nonspecific individuals and sets or compounds of nonspecific individuals, by analogy with the values of Lappin and Francez's functions). This is carried out in chapter five and chapter six. Some might, with reason, want to suggest that our proposal faces insurmountable ontological difficulties. In our view, however, no special ontological implication should be conferred to our interpretation because our notion of nonspecific reference and nonspecific referent is a reflection of a similar notion coined in recent pragmatic and cognitive theories dealing with referring and indexical expressions. In such theories, nonspecific or unspecified reference associated with a referring expression is reference whose interpretation on the hearer side cannot be made completely explicit because it depends mostly on what the speaker has in mind about an object but does not intend to explicitly communicate. Thus, if we think of nonspecific reference as the result of subtle referring mechanisms and constructions assumed by speakers and hearers when processing discourse, then our interpretation (and representation) of the values of the donkey functions only needs a philosophical rationale showing that speakers and hearers are systematically committed to this kind of reference in verbal communication involving anaphoric processes. This justification is, as we shall show in chapters two and four, mostly provided by accounts dealing with ***direct reference*** phenomena and defended by theorists working on pragmatics and cognition, like Bach, Evans, Recanati, Stalnaker, and others.

The rest of this chapter introduces some essential semantic background and motivates some relevant issues to be discussed later in the dissertation.

1.2 Tarskian Semantics and Natural Language Syntax

In this section we will describe, in a simplified way, some general views about syntax and semantics that will serve as a general basis for our research in the forthcoming chapters.

The following questions can be considered the most general ones to be answered for any semantics.

(i) What is the nature of the structures to be interpreted?

(ii) What is the nature of the semantic values computed in the course of interpretation?

(iii) What are the principles according to which interpretations of the structures determine the computed semantic values ?

Many linguists and semanticists working in the Chomskyan paradigm felt long ago that a systematic answer can be given to these questions. This answer, according to them, should be the result of spelling out how syntax interacts with truth-theoretic constraints. In particular, Higginbotham (1983, 1985, 1986), May (1977, 1985), Neale (1990, 1993), Larson and Segal (1995), among others, have advocated the need for the construction of a truth-conditional semantics within a Chomskyan framework, where interpretation is always sensitive to two crucial principles of any extensional semantics: the Referentiality and Compositionality Principles.[1] The first says, according to the Fregean tradition, that the values of sentence expressions are always their denotations or references. The second indicates that we have to construct the meaning of complex expressions by means of the following constraint: the values of complex expressions are always a function of the denotations of their component expressions.[2]

According to the most recent views defended by Chomsky and his followers (now termed *Principles and Parameters Theory*), interpretation mechanisms are instances of the general language faculty—a modular system of the mind/brain—constrained by the principles of Universal Grammar (UG). UG contains, in its turn, a set of modules determining syntactic or formal structures and properties, which are generated according to modular principles and theories, for instance, the binding theory, X' theory, theta theory, bounding theory and so on.[3] These modules and their principles systematically

[1] The use of the phrase "being sensitive" instead of "being constrained" is meant to indicate that the theorists in question do not take the autonomy of these semantic principles to be absolute.

[2] In the Fregean framework, this principle is a consequence of the so-called Context Principle: only in the context of a sentence the words do have any meaning (see Frege (1953) and Dummett (1981)).

[3] See Chomsky (1981, 1986)

reduce the problem of interpreting sentences bearing characteristic configurations—e.g. infinitive and nominal constructions, quantifier structures, anaphoric relations—to a syntactic problem: what sorts of syntactic structures qualify as admissible structures in UG? The syntactic theory that, within the UG paradigm, tackles this question is the so-called *Goverment and Binding* (GB) theory (or theories). For most GB linguists, the main goal of the GB theory was to introduce, only on the basis of syntactic criteria, something like the quantifier-variable structure of the first-order calculus (FOC henceforth) in the explanation of problems in syntactic form. These are problems related, for instance, to the explanation of the so-called *wh*-phrases and to the clarification of certain dependencies among quantified noun phrases (QNP henceforth)—in particular, anaphoric dependencies. By doing so, GB theories have also showed how scope relations between QNPs are crucial for determining syntactic structures of quantified sentences, which determine, in their turn, unambiguous representations at the level of interpretation. GB linguists were interested particularly in the movements QNPs are (or may be) subject to, given certain scope assignments at the surface level.[4] A general movement rule of QNPs that represents scope syntactically was then proposed, the so-called *Quantifier Raising* (QR) rule. It can be implemented in different, compatible ways. The most common is that which represents QNPs by adjoining them to that site in the sentence where they are supposed to determine scope. In this way, in being represented, QNPs are forced out of their original position in the sentence and 'raised' to other position. A simple example, which comprises a surface sentence (4), its FOC structure (5) and the structures (6) and (7) that the QR rule generates for the sentence in terms of constituents,[5] is given below.

(4) all logicians smoke.
(5) $(\forall x)$ (logician x $\rightarrow$ smoke x)
(6) $[_S\, [_{NP}$ all logicians $]_2\, [_{VP}$ smoke $]\,]$
(7) $[_S\, [_{NP}$ all logicians $]_2\, [_S\, e_2$ [smoke]]]

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[4] Later on in this section a definition of the notion of logical scope will be given.

[5] 'Constituent' is a standard linguistic expression used in ***constituent analysis***, which specifies the structure of sentences in terms of phrase-markers or linguistic units like NP, VP, PP etc. and distinguishes between *immediate* and *non-immediate* constituents.

In (6) and (7), the QR rule creates what is called an S node with scope over, or technically speaking, 'immediately dominating', the original quantified sentence with constituents NP and VP, i.e. the original S node. Thus, the raised quantified NP is an immediate constituent of the new S node and a 'sister' to the original S node. The expression e_2 in (7) is a ***trace*** (technically, an empty category) left by the raised quantifier. It can then be seen as a variable 'bound by' that quantifier, playing the same role as the bound variable associated with the predicate *smoke* of the FOC structure (5) (for details of binding see chapter three). Thus, sentence (7) represents the grammatical structure of (4) on the basis of reflecting its relevant syntactic properties.

Three clarifications are needed here. First, although intuitively connected to (5), structure (7) is a syntactic and not a logical representation of sentence (4). Structure (7) renders explicit such properties as constituency, movement, dominance, and empty category, which are well-established properties of the description of natural language grammar, and with no use in logical languages like FOC. So, structure (7) does not belong to a logical or semantic—in the referential sense of the word—level of representation. On the contrary, as suggested by linguists working on early Chomskyan theory, (7) belongs to an independent, abstract and syntactically-motivated level of representation of natural language, called *Logical Form* (LF).[6] LF has been subsequently developed in the 198Os, in the framework of GB theories, by Chomsky, Higginbotham, May, Reinhart, and others.[7]

The second clarification is that in classical LF theory there are at least two different levels of syntactic representation together with LF, namely, Deep Structure (DS) and

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[6] See, for example, Mc Cawley (1968), Harman (1972), Lakoff (1972).

[7] The notion of LF is used loosely here. Sometimes it will refer generically to the syntactic level itself, and at other times it will refer to the particular structures generated at that level. Since such loose use is common in linguistics and in semantics (similarly to the use of the notion of Deep Structure in early Chomskyan theory) this should not affect our exposition.

Surface Structure (SS) levels[8]. DS level, which represents the first derivational level in a grammar, instantiates—in terms of constituents—structural properties of sentences directly projected from their lexical constitution. Structures of DS level (or DSs) are, in their turn, mapped onto structures of SS level (or SSs) by moving constituents in accordance with general rules of movement.[9] The last clarification is that SSs are mapped onto the LF level by using other (covert) movements, for example, the QR rule.

Two consequences follow from the previous clarifications. The first is that the LF level and the representations generated in it 'mediate' between SSs and the semantic interpretation of SSs. However, it is evident, according to LF theorists, that once the relevant syntactic information is encoded in LF structures, SSs are completely dispensable in the process of interpretation; only LFs are the object of direct interpretation (May 1985, Chierchia and McConnell-Ginet 1990).[10]

The second consequence is more general. It is that, to the degree that LF structures are only motivated by syntactic criteria, they are syntactic in nature. The question is, then, how are these syntactic structures to be truth-theoretically interpreted? On a more explicit level, How can it be shown that LF structures are systematically connected with truth-theoretic structures? The answer to this question will also indicate the route to an answer to questions (i)–(iii). In short, the connection lies in the way that quantification and its

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[8] The last development of the Chomskyan paradigm, the so-called ***Minimalist Program*** (Chomsky 1995), dispenses with both DS and SS altogether.

[9] In fact, there is one general rule determining acceptable movements in GB theories, the so-called 'move ∝' rule (see chapter three for a definition). Nevertheless, an additional level of representation should be considered when it comes to mapping SSs: the Phonological Form (PF) level. In this latter case the mapping from SSs proceeds according to 'overt' movements. Our description of these notions are certainly over-simplified.

[10] The purported 'dispensability' of the SS level and its structures is denied by theorists who reject the LF-picture. See Williams (1977, 1986), Lappin (1991) and May (1991) for discussion. On the other hand, there are more issues involved in the relation LF-SS than those concerning semantic interpretation. For example, as pointed out by Neale (1993), mappings between SSs and LF-structures depend on the grammaticality of the SSs. In other words, if a surface level sentence is in principle ungrammatical by normal standards, it is not possible to construct a mapping between it and a well-formed LF-structure.

associated mechanisms operate in natural language. That is, on how quantification mechanisms constrain the semantic representation of natural language sentences. Thus, the crucial notions establishing the above connection are those of quantifier and logical scope. A truth-theoretic semantics—that is, one that is governed by the Referentiality and Compositionality Principles—for a quantificational language L must provide a definition of truth for L. In doing so, the referential semantics must specify the formal structure of any sentence S of L—the **logical form** or **lf** [11] of S—in terms of quantifiers and scope. [12] In what follows, we will briefly show how this can be done.

Also, in order to provide **lfs** for English, the truth-theoretic semantics will, in some cases, need to replace the FOC structures with more riched ones so as to capture quantificationally more complex constructions. Such new structures will enable us to deal, for example, with sentences containing quantifiers like *most* or *few*, which are not first-order definable. [13] As a result, in those structures the determiner (an expression like

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[11] Sometimes we will use the label **lf** to describe both the level of representation and particular structures at this level, in a similar way to our use of the label LF.

[12] See Neale (1993). This formulation is over-simplified. As we shall see, truth-definitions, along Tarskian lines, are systematically related to axioms and valid biconditionals (T formulae) possibly formulated in terms of a satisfaction relation and sequences. The best exposition of this approach is in Larson and Segal (1995).

[13] See Rescher (1962), Kaplan (1966), Wiggins (1980), Barwise and Cooper (1981). As ***most*** seems the most representative case of non-first-order definable quantifiers we shall concentrate on it in this note. On the one hand, from an informal viewpoint, the following example provides an intuitive basis for the irreducibility of ***most*** to first-order devices.
(i) Most tennis players are right-handed.

If we are to treat (i) as a combination of a quantifier, say M, and the complex propositional function 'x is a tennis player and x is right-handed' then we will get the wrong predictions since (ii) below does not states the same as (i).
(ii) (Mx)[tennis player x & right-handed x].

Because the range of the quantifier M in (ii) is not explicitly restricted to a certain particular universe or domain of individuals, (ii) determines an interpretation according to which most individuals (in any universe) are tennis players and right-handed.

On the other hand, although it is not the purpose of the thesis to discuss formal facts about non-first-order-definability of some natural language quantifiers, we will give at least an idea of such facts with respect to ***most***.

First fact: Irreducibility. As H. Kamp (1996, p.6) notices, although it is common to define *most* by means 'every,' 'some,' 'most,' or 'many') combines with a formula (or predicate) to form a ***restricted quantifier phrase***. It is desirable therefore having a semantics for English that allows us to treat all English quantifiers as restricted quantifiers. [14]Definitions introducing these quantifiers will be provided later on.

As Tarski taught us, in order to obtain a characterization of the truth predicate for a language L, we need to have a theory that gives us T-schemas like in (8).

(8) 'S' is true in v if and only if p (T)

In (8), 'S' is a structural description of a sentence of L (the object language), v is a

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of some of the two conditions below, just the second, finitary, condition is in agreement with our intuitions about the meaning of ***most*** and allows us to prove the irreducibility of the latter to first-order operators.
(MOST) "Most A's are B's" is true iff $|A \cap B| > |A\text{-}B|$
(MOST^{FIN}) If A is finite, then "Most A's are B's" is true iff $|A \cap B| > |A\text{-}B|$

More technically, the second condition allows us to prove that reducibility of ***most*** to first-order operators is not possible within the theory of finite models (for some details on models see below in this section). As Kamp formulates it (Kamp, op. cit., p. 6), this means it is possible to prove the following fact (where the function F enables us to specify a binary operator O between sets, i.e. a binary generalized quantifier): "There is no combination of (i) a function F from finite sets U to sets of subsets of U and (ii) a first order formula $\Phi(P,Q;x)$, built up from the predicate constants P,Q, variables and logical constants, in which at most x occurs free, such that for every finite first order model $M=<U,I>$:

$|I(P) \cap I(Q)| > |I(P)\text{-}I(Q)|$ iff $\{u \in U : M \vDash \Phi(P,Q;x)\,[u]\} \in F(U)$ " (the proof of this fact is far from trivial; see Kamp (op. cit., pp. 6-13); and Westerstahl (1989, pp. 24-32)).

Second fact: Non-axiomatizability. This fact establishes that first-order logic plus ***most*** leads to non-axiomatizability. Very roughly, let $L(Mo)$ be an extension of the first-order language, created by adding the (generalized) quantifier Mo, which can be interpreted as our *most*. It is possible thus to prove the following strong result: if we have a language $L(Mo)$, then the set of logical truths of $L(Mo)$ is not recursively enumerable. For the proof of this fact see Kamp (op.cit. pp. 14-5). Kamp emphasises that the proof in question hinges on the assumption that the semantics for Mo satisfies the condition **(MOST)** above for infinite sets. Finally, the same result of non-enumerability applies also to logical consequence.

[14] Restricted quantifiers are intertranslatable with so-called ***binary quantifiers***, i.e. very roughly, determiners that combine with a pair of formulae (or predicates) to form a formula. Binary quantifiers behave like two-place operators expressing relations between two universals, concepts, or properties—this accords with the way Aristotle treated quantifiers in his syllogistic. In fact, Frege ([1982], reprinted in his (1952)) was the first aware that all of the usual quantifiers (including first-order ones) in natural language stand for binary quantifiers. Nonetheless, he also discovered that first-order binary quantifiers (like 'all', 'no', 'some') could be defined by means of unrestricted or unary ones and sentential connectives. As Westerstahl says, "[T]his was no trivial discovery at the time, and Frege must have been struck by the power and simplicity of the unary universal quantifier. In his logical language he always chose it as the sole primitive quantifier" (Westerstahl (1989, p. 12)).

situation or a specification of the relevant facts and p describes (in a metalanguage) the conditions that have to obtain for S to be true in v. As is also known, (8), according to Tarski, does not constitute a definition of truth but at most a theorem entailed for all acceptable definition of truth.[15] It specifies a ***material adequacy condition*** that any of the truth definitions must meet. So, we should expect, with respect to a sentence like (4) above, that a characterization of the truth predicate for English provides us with the T-schema in (9) below. With (9), we obtain a direct interpretation of the sentence 'all logicians smoke' in terms of its truth-conditions.

(9) 'all logicians smoke' is true in v iff all logicians smoke.

In formal terms, the best way to approach the interpretation of sentences like (4) requires to consider a formalized fragment of English containing **lfs** like (5) above. Presumably, the most striking feature of this fragment is the systematic introduction of variables and quantifiers. The result will be an indirect but completely formal and compositional interpretation of the sentences in question.

In order to generate formal relative-to-a-situation interpretations of formulae in a language L is advisable to provide a **model** of such formulae. In Cann (1993) models are informally introduced as follows:

> There are two parts to the interpretation procedure. In the first place, interpretation takes place, not in a vacuum, but with respect to a representation of a state-of-affairs. Such a representation is called a **model** and models have two parts: an **ontology** and a **denotation assignment function**.[...] The ontology of the model provides the basis for interpretation in that it defines what exists and so what can be talked about. [...] The association of constants with entities in the model is done by the denotation assignment function. [... T]he **denotation** is the relation between the expression and things that exist in the

[15] See Tarski (1956), and Chierchia and McConnell-Ginet (1990).

> world. Since the world for our purposes is given by the model of the world or situation, what is denoted by an expression in [L] is something in the model (Cann, 1993, pp. 39-40)

The denotation assignment function and the denotations above can be understood simply as the ***interpretation function*** and the semantic values of the model, respectively. So, a model M for L is an ordered pair <**D**, **F**>, where **D** is a nonempty set, the set of individuals or objects that constitute the domain or universe of M, and **F** is an interpretation function, which assigns a semantic value to each nonlogical constant of L (i.e. to each individual constant and predicate expression). Usually, **F** assigns individuals to individual constants and sets of n-tuples of individuals to n-place predicate expressions. In this way, models are mathematically abstract structures based on the set theory apparatus that we use as auxiliary devices in providing interpretations about things in the world that constitute semantic values of expressions of our object language.

Let us assume a model M_1=<$\mathbf{D}_1$, $\mathbf{F}_1$> in which $\mathbf{D}_1$ is the set: {Russell, Frege, Moore}; and in which $\mathbf{F}_1$ assigns an element of $\mathbf{D}_1$ to each individual constant of L. This element is the denotation or extension assigned by $\mathbf{F}_1$ to the constant. In turn, $\mathbf{F}_1$ will assign sets of individuals and sets of ordered pairs of individuals of $\mathbf{D}_1$ to one-place and two-place predicates, respectively. Such assignments can now be represented as follows:

(10) $\mathbf{F}_1(a)$=Russell; $\mathbf{F}_1(b)$=Frege; $\mathbf{F}_1(c)$=Wittgenstein

(11) $\mathbf{F}_1(F)$= the set of the logicians; $\mathbf{F}_1(G)$=the set of the Germans; $\mathbf{F}_1(H)$=the set of the persons who disagree with somebody.

According to our world knowledge, (11) is extensionally equivalent to (11') below [where the two-places predicate '*H*' denotes a set of ordered pairs of $\mathbf{D}_1$ such that the first member of the pair disagrees with the second member].

(11') $\mathbf{F}_1(F)$={Russell,Frege}; $\mathbf{F}_1(G)$= {Frege}; $\mathbf{F}_1(H)$= {<Russell, Frege>, <Wittgenstein, Russell>}.

It is common practice in model theory to represent the semantic values of an expression α with respect to a model M by means of $[\alpha]$. Armed with this notation we can translate the assignments made by $\mathbf{F}_1$ in (10) and (11') as follows:

(10') $[a]^{M1}$ = Russell; $[b]^{M1}$ = Frege; $[c]^{M1}$ = Moore

(11") $[F]^{M1}$= {Russell,Frege}; $[G]^{M1}$= {Frege}; $[H]^{M1}$= {<Russell, Frege>, <Wittgenstein, Russell>}.

It is easy to see that under the model M_1 the sentence '*Fb*' is true, given that the individual denoted by '*b*' belongs to the set which is the extension of '*F*', whereas the sentence '*Ga*' is false because Russell does not belong to the extension of '*G*'. Also, the sentence '*Hab*' is true because the ordered pair <Russell, Frege> belongs to the set that is the extension of '*H*', whereas the sentence '*Hbc*' is false because the pair <Frege, Wittgenstein> does not belong to the extension of '*H*'.

Since the syntax of the sufficiently rich language L generates an infinite number of sentences, the theory of truth for it must incorporate a mechanism for generating all of the correspondingly infinite number of T-schemas. This means that specification of the truth-conditions for each sentence of L must be compositional, i. e., "by looking at the way it is built in terms of smaller units" (Chierchia and McConnell-Ginet 1990, p.66). In other words, we have to construct the semantics of L by looking at the semantic value of such smaller units and supplying an algorithm for combining them.

Tarski (1956) provides the framework for this sort of semantics. He uses the notions of ***satisfaction*** and ***sequence*** in order to generate the respective truth schemas and, in doing so, he defines the truth for a formal quantified language (QL).[16] The most important advantage of introducing satisfaction lies in the possibility of compositionally defining truth in L, taking into account open sentences as building blocks of the truth definition

[16] In fact, Tarski considered a much simpler language—the language of classes theory—than the one we are going to consider here, which presupposes non-first-order definable, restricted, quantifiers.

process. This feature is crucial given that in a quantificational language most compound sentences are built up from simpler open ones. Since the latter contain unbound or free ocurrences of variables, like in 'Φx_1' or '$\Psi x_1 x_2$', and free variables do not denote individuals or objects, open sentences are not true or false ***tout court***. Satisfaction incorporates these sentences in the process of characterizing truth for QL by implementig the idea of ***truth relative to an assignment of values to variables***. Thus, in that process, open sentences are considered ***true-of*** or ***false-of***—i. e., satisfied or not by—individuals or sets of n-tuples of individuals. Furthermore, another advantage of introducing satisfaction is that it will enable us to handle sentences quantificationally more complex than sentence (4), e.g. sentences with more than one quantifier and/or with many-place predicates.[17]

In a complete model-theoretic semantics for QL, satisfaction requires that a function ***g***, called ***value assignment function***, be singled out, which assigns to each variable of QL an individual or element of **D.**[18] However, since our dissertation is going to presuppose just a minimum of model-theoretic notions, a simplified Tarskian characterization of truth (given only in terms of satisfaction and sequences) will be offered here. We will dispense with most relative-to-a-model devices, with the exception of the interpretive function $[\![\alpha]\!]$.

In order to carry out the goal of characterizing compositionally truth in terms of satisfaction and sequences, we need to add recursive definitions of satisfaction for each relevant particle, e.g. singular terms, quantifiers, connectives, etc. To do this, we need to specify the syntax of QL and the definition of formula of QL.

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[17] Nested quantifiers like the universal one in (i) below represent a characteristic problem for non-Tarskian semantics (see Engel 1989). For a formal explanation see Larson and Segal (1995, pp. 237-8).

(i) $(\exists x)(\ Rx \ \&\ (\forall y)\neg Cxy\ )$

[18] Thus, in giving the semantics of the quantifiers, this function "will enable us to keep the facts fixed when we consider different assignments to variables" (Chierchia and McConnell-Ginet 1990, p.100). Usually the symbol $[\alpha]^{M,g}$ points out the semantic value of the expression α with respect to the model M and the function ***g***. Furthermore, ***g*** does not need to be a biunivocal function.

Syntax of QL

A. Vocabulary

1. Individual Constants: '*a*', '*b*', '*c*', ...
2. Individual Variables: 'x_1', 'x_2', 'x_3', ...
3. Predicative expressions: '*F*', '*G*', '*H*', ...
4. Connectives: '$\neg$', '&'.
5. Quantifiers: '$\exists$', '$\forall$'.

B.Definition of formula

1. A *n*-place predicative expression followed by *n* individual constants or variables is an atomic formula.
2. If '*A*' is a formula '$\neg A$' is a formula.
3. If '*A*' and '*B*' are formulae, '*A* & *B*' is a formula.
4. If '*A*' is a formula and 'v_k' a variable, then '$\exists v_k A$' and '$\forall v_k A$' are formulae.

The definitions above illustrate how quantification, scope and other related notions become a key part of the truth definition of natural language sentences. In particular, part *B* allows us to clarify several important facts. First, according to B1 and B4, we can define the concept of a sentence in QL. An open sentence will be a formula (atomic or quantified), where at least one variable occurs free or unbound by quantifiers. A closed sentence will be the formula (atomic or quantified) where no variable occurs free or unbound by quantifiers. Secondly, a variable u is free in a formula Φ if and only if it falls outside the scope of any quantifier expression. Finally, the *scope* of a quantifier expression, in the Tarskian theory, is the smallest formula containing the quantifier, i.e. the quantifier plus the formula that it combines in order to form a well-formed formula.

Sequences are crucial to the definition of truth by satisfaction. A sequence differs from a set just in the order of the objects. Consequently, a sequence is a series of ordered *n*-tuples of individuals or list that satisfies a formula (an open sentence or predicate). Also, a sequence can be a possibly infinite list of objects. The requirement that sequences be ***ordered*** *n*-tuples of individuals is to ensure the one-to-one correspondence between members of the sequences and the variables of the formulae, the variables being ordered or numbered as well. The reason to assume a possibly ***infinite*** series of objects has to do with the possibly infinite domain or universe.

Recursive definition of truth in QL

A. Axioms of reference

1. ⟦*a*⟧ = Russell

2. ⟦*b*⟧ = Frege

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1. ⟦*F*⟧ = the set of the logicians (in symbols, {x: x is logician})
2. ⟦*G*⟧ = the set of the smokers (in symbols, {x: x smokes})
3. ⟦*K*⟧ = the set of ordered pairs of individuals such that the first disagrees with the second (in symbols, {<x,y> : x disagrees with y})

The underlying idea of satisfaction of an open sentence Φ by a sequence **s** in the Tarskian approach is that an object in the *k*-th position of the sequence—i.e. the object $\mathbf{s}_k$—is paired up with the variable x_k in the sentence. This idea and the previous definitions imply the following general definition of *reference with respect to a sequence* (*Ref*).

(12) *Ref*('x_k' , **s**)= $\mathbf{s}_k$ ['x_k'=(the name) of the *k*-th variable, and $\mathbf{s}_k$=the *k*-th element in **s**]

Schema (12) shows that the reference of a variable x_k with respect to a sequence **s** depends upon the choice of the sequence. For example, if **s** = <Russell, Madrid, Frege> then *ref*('x_3', **s**) = Frege. If **s** = <London, Russell, Russell>, then *ref*('x_3', **s**) = Russell. Given that both variables and constants can be treated as terms of the form α_i, one can recursively characterize truth in terms of satisfaction and sequences for QL in the following way:

B. Recursive definitions

1. A sequence **s** satisfies '$\Phi\alpha_1 \dots \alpha_n$' (where 'Φ' is a *n*-place predicate followed by *n* variables or individual constants) iff *Ref*('α_1', **s**) , ... , *Ref*('α_n', **s**) are Φ.[19]

[19] Sentences without variables can be considered as true if they are satisfied by the ***null*** sequence ⌀. So, for instance, ⌀ satisfies *Fa* iff *Fa*.

2. A sequence s satisfies '$\neg A$' iff s does not satisfy 'A'.
3. A sequence s satisfies 'A & B' iff s satisfies 'A' and s satisfies 'B'.
4. '$(\exists v_k)\Phi$' is satisfied by s iff Φ is satisfied by *some* sequence s' that differs from s at most in the k-th position.
5. '$(\forall v_k)\Phi$' is satisfied by s iff Φ is satisfied by *every* sequence s' that differs from s at most in the k-th position.[20]
6. A sentence is true iff it is satisfied by every sequence (a sentence is false iff it is satisfied by no sequence).

It is easy to see that *B*.6 entails the following consequence (we presuppose a metalanguage for QL containing variables ranging over sentences and predicates of QL):

(13) 'S' is true in QL iff every sequence satisfies p ('S' is false if no sequence satisfies it)[21]

As expected, these definitions allow us to prove a theorem of the form in sentence (14) below given the quantified sentence 'all logicians smoke' (we presuppose the usual definition of the conditional):

(14) '$(\forall x)$ (logician x $\rightarrow$ smoke x)' is true iff all logicians smoke.

And obviously, from (14) we can obtain the absolute—i.e. not relative-to-models—T-schema of sentence (4) specified in (15) below, what shows that the definition of truth in *B*.6 for QL meets Tarski's material adequacy condition.

(15) 'all logicians smoke' iff all logicians smoke.

We now introduce Tarskian definitions for natural language restricted quantifiers (in this case we will talk about ***determiners*** instead of FOC quantifiers). These definitions stipulate that if Φ and Ψ are wffs, u is a variable, and Q a natural language determiner, then '[Qu: Φ]Ψ' is a well formed formula (wff). So, (16) and (17) will be the expected new definitions for natural language restricted quantifiers (RQ henceforth).

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[20] See Guttenplan (1986) and Haack (1978) for explanation of definitions B.4 and B.5.

[21] See Tennant (1978), Baldwin (1975), Gutenplan (1986) and Haack (1978) for more detail.

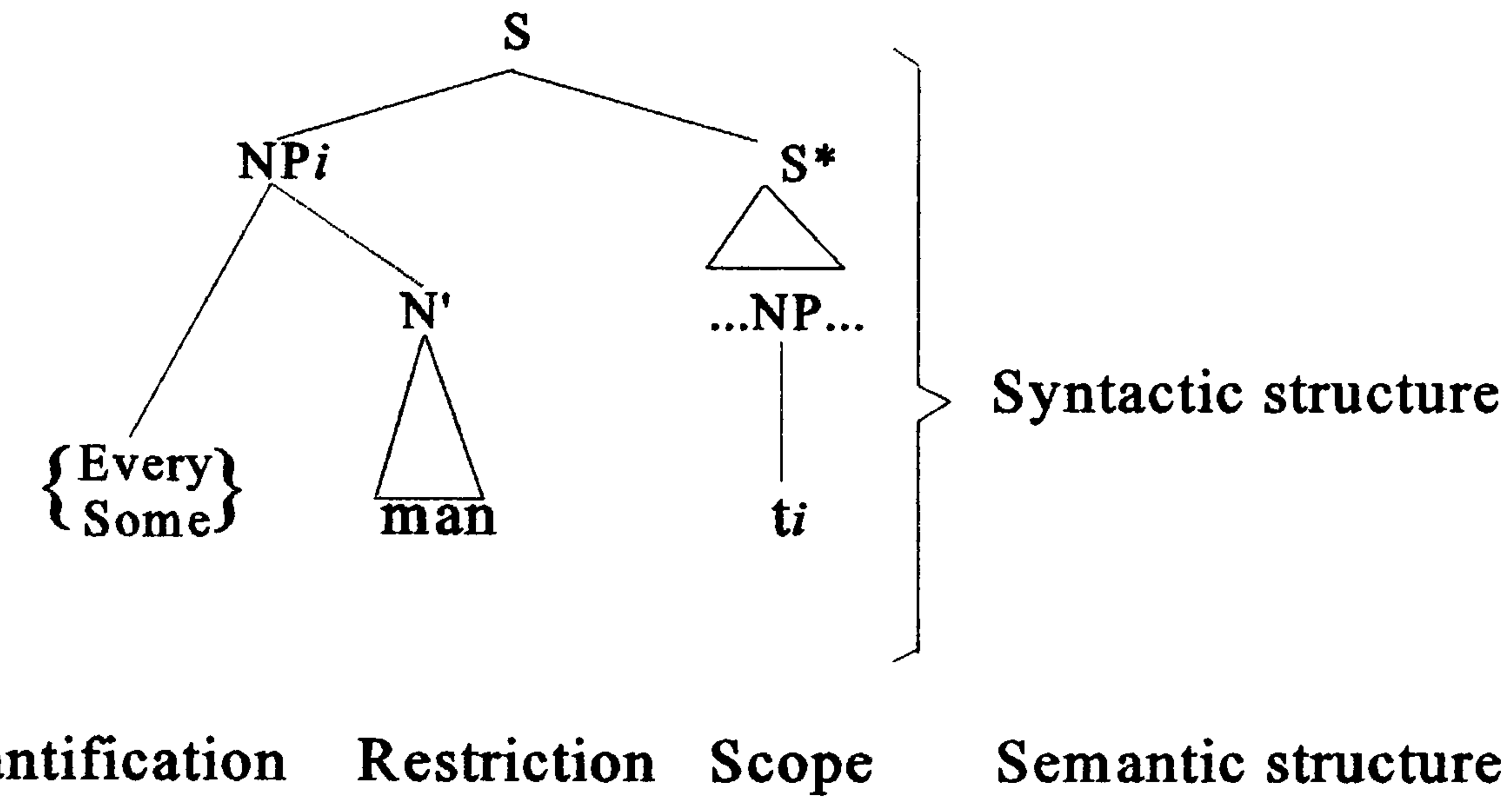
(16) ' [all x_k: Φ]Ψ' is satisfied by **s** iff Ψ is satisfied by ***every*** sequence **s'** that both satisfies Φ and differs from **s** at most in the *k*-th position.
(17) ' [some x_k: Φ] Ψ' is satisfied by s iff Ψ is satisfied by ***at least one*** sequence **s'** that both satisfies Φ and differs from **s** at most in the *k*-th position.
(18) ' [most x_k: Φ] Ψ' is satisfied by s iff Ψ is satisfied by ***most*** sequences **s'** that both satisfy Φ and differ from **s** at most in the *k*-th position.

Definitions (16)–(18) apply directly to RQ formulae of the form '[Qx: Fx] (Gx)' rather than to the familiar FOC formulae exemplified by (5) above. Chapter three will discuss at lenght RQ formulae.

We can now see that the definitions above (or other alternative ones) flow from the semantic demands that the satisfaction theory is supposed to meet. That is, they result from the demands imposed by the Tarskian theory in the course of providing a principled and systematic account of the truth-conditions of sentences in a quantified language. The definitions do not depend, as it were, on any syntactic or grammatical approach to the quantificational language. However, despite this theoretical independence, Tarkian satisfaction axioms (and the semantic notions that they implement) can apply to syntactic structures, in particular, to LF structures. More precisely, as Larson and Segal put it, Tarskian axioms "apply to LF representations, in which quantified NPs appear in adjoined positions and bind a trace [*t*] in their sister S" (Larson and Segal 1995, p. 247). This is confirmed if we observe the diagram in (19) below, which specifies the correspondence between syntactic and semantical structures[22]. In the upper part of that diagram, the sentence whose truth-conditions are to be determined (S), is the highest branching node immediately dominating both the NP_i node and its sister S*. In turn, the S* node contains a trace, t_i, that relates to (or is bounded by) the NP_i node. The question is thus: Why should Tarskian notions, which belong to the lower part of the diagram, apply to the structures in the upper part?

[22] This diagram comes from Larson and Segal (1995).

(19)



A general response to the above question has already been suggested here: the correspondence between the two types of structures results from the way in which both LF theory and Tarkian semantics describe the quantificational mechanisms underlying natural languages. On the basis of the diagram (19), let us now substantiate this response. Tarskian axioms are in correspondence with LF structures because the first induce a structural division in the quantificational semantics that closely parallels to the structural division provided by the LF syntax. According to definitions (16)–(18), the quantificational constituents of a sentence—i.e. its QNPs—can be divided into three parts: a quantifier, a restriction and a scope. The quantifier, which corresponds to the determiner in the upper side of (19), is that part of the sentence stating how many sequences satisfy the formula in the restriction. The restriction, which corresponds to the N' restriction in the upper side of (19),[23] is the formula stating which individuals appear in the *k*-th position of a sequence (men, logicians etc.). And finally, the scope, which corresponds to the S* node with the trace t_i in the upper side of (19), specifies that the *k*-th individuals of the sequence satisfy another formula (*smoke*, *agree*, etc.). In other words, it specifies what is true of those individuals.

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[23] Later in the thesis a distinction will be made between the head of the NP (the Nominal restriction) and the N' restriction; see chapter six, section 6.1.

Larson and Segal formulate the following conclusion about the correspondence between the two mentioned structures.

> With quantification, we see a clear convergence of syntactic and semantic results[...S]yntactic representations with quantifier raising have been advanced by syntacticians on grounds independent of quantifier semantics. Correlatively, [...] reflections on the semantics of quantification arose without consideration of the form of quantifed sentences. That the two should come together neatly is surely more than an accident. (Larson and Segal 1995, p.248)

The correspondence in question is shown not only at the level of structures but at the level of principles too. In particular, three important and well known syntactic principles of GB theories can interact with the Tarskian theory[24]. The first principle is the definition of a structural relation obtaining at LF—the *c-command* relation. The definition is as follows.

(CC) A phrase X **c-commands** a phrase Y iff neither of X or Y dominates the other and the first (branching) node dominating X, dominates Y.

The c-command relation allows us to formulate two general constraints on the well-formedness of structures which result either from binding syntactic parameters within such structures or from scopal interactions between different QNPs. These constraints are the proper ***binding constraint*** (BC) and the ***general scope principle*** (GSP).

(BC) A referentially variable expression x can be interpreted as a variable bound by a quantified expression *Q* only if *Q* c-commands x at LF.

(GSP) An expression α is interpreted as having scope over an expression β just in case

[24] According to Larson and Segal (1995, p. 248), (CC), (BC) and (GSP) operate as axioms or assumptions in GB theories. Prof. J. Higginbotham (p.c.) disagrees with this conclusion; these tenets can, according to him, be effectively derived from more general principles at the LF level. See Higginbotham (1988).

α c-commands β.[25]

As we shall see later in this essay the principles and definitions above will play a fundamental role in the explanation given by LF theories of anaphoric phenomena.

We are now in a position to describe the answer given by LF theorists to questions (i)–(iii) raised at the beginning of this section. Concerning question (i) they claim that the structures to be interpreted are the linguistic representations specified by the LF structures provided by the syntactic modules. According to these theorists, interpretation takes place when those structures are systematically mapped into **lf** structures. S. Neale, for example, emphasises his commitment to this view in the following terms:

> I suggest, then, that an independently motivated syntactical theory that delivers an S-Structure representation and an LF representation for each sentence [S] of a fragment of a given language ought to be of considerable interest to philosophers and linguists who take the logical form **[lf]** of a sentence S belonging to a language L to be the structure imposed upon S in the course of providing a systematic and principled semantics for L. Arguably, we can make serious progress by exploring the view that a fully worked out theory of LF will be a fully worked out theory of logical form **[lf]**.

Concerning question (ii) LF theorists claim that semantic values should be conceived as extensions and that the meaning of a sentence (or its SS) must be associated with these extensions, in particular, with its satisfaction conditions. Finally, concerning question (iii) LF theorists claim that Referentiality and Compositionality are the semantic principles organizing the interpretation of LF structures. Nevertheless, these theorists mantain that such principles need to interact with (or perhaps to be constrained by)[26] the general UG

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[25] All these formulations are taken from Larson and Segal (1995) chapter seven; in particular see pp. 249–50 for a clear explanation of (CC) and (BC) in terms of sequence variants. In chapter four, section 4.4, and chapter six, section 6.3, of this essay, we will talk more loosely about a 'Scope Constraint,' thereby referring to Heim's specification of (GSP) that prohibits intersentential anaphoric connections.

[26] Such a radical view of semantic principles, for example, of the principle of Compositionality, is advocated by Larson and Segal (1995). These authors hold that Compositionality is mostly determined by the ***Autonomy of Syntax*** principle, persistently defended by Chomsky. According to them, Compositionality (or any other

principles organizing the syntactic modules.

To be sure, the above answers raise new questions. Two of them, for example, have to do with the alleged capacity of semantic values to exhaust the interpretations and meanings of sentences (especially of sentences embedded in discourse) and, conversely, the absence, in the above principles, of any allusion to context-sensitive mechanisms. These and other more specific questions will be considered in the next chapter. Before proceeding to these questions, we must say something about which semantic background we are going to prefer in order to interpret more complex sentences than the ones so far examined, in particular, sequences of sentences containing anaphoric pronouns.

1.3 Representations and Discourse: Some Basic Issues

Tarskian semantics has a wide spectrum of application. It can however not handle examples such as the following:

(20) Every teacher in the school presumes *she* will get the prize this year.
(21) Mary wants to marry *a young man*. *He* must be a millionaire.

The pronouns, in the examples above, can receive more than one interpretation and, therefore, the sentences containing them cannot posses univocal truth-conditions. In each case, the non-univocality of interpretation depends on lexical factors such as the presence of the attitudinal verbs *presume* and *want* or the modal auxiliary verbs *will* and *must*. Structural factors—e.g. assignments of scope—can also be isolated in (20) and (21). Nevertheless, it is undeniable that in the interpretation of all these cases three non-linguistic factors play a central role. They are (a) factors concerning the utterance context; (b) factors concerning the cognitive situations of the hearers who process (and disambiguate) the uttered sentences; and (c) factors underdetermining the processing of

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semantic principle for that matter) has therefore 'strict local' application. That is, it does not introduce any structure of its own in the smaller units of meaning.

sequences of sentences anaphorically related each other, i.e. anaphoric ***discourse***. Without considering these factors, determining the meaning of sentences (20) and (21)—as well as sentences of greater complexity—could hardly be achieved.

The study of such factors have evidently not been overlooked by Tarskian theorists. For instance, work by Kaplan (1977, 1978, 1979) and Burge (1974), has resulted in classical approaches to demonstratives, deictic pronouns and, in general, indexicality, within a Tarskian framework. However, given the present purposes of the dissertation we will consider another line of research here. Our reasons for such a choice are two. First, the classical approaches above do not treat cognitive processes of speakers and hearers connected to reference mechanisms systematically. Second, Tarskian approaches to indexicality focus only on sentences that are regarded as the unit of meaning. Nevertheless, since anaphoric processes can occur within and outside sentential boundaries, a wider conception of meaning taking into account complex sequences of sentences or discourses is required.

Semantic theories developed independently by H. Kamp and I. Heim in the early 80s, have emphasised the relevance of the above considerations for any semantics of discourse. These theorists emphasise the importance of seeing semantic structures as reflecting both formal constraints which mental representations are subject to and the interaction of these representations with contextual factors. In this sense, their theories —in particular Kamp's—may be related to the mentalistic and cognitive hypothesis put forward by Fodor under the name of Representational Language of Thought, or Mentalese.[27]

Kamp claims that semantic structures must represent structural features of the relations that hold among different cognitive states (for instance, beliefs) of speakers or hearers

[27] See Fodor (1975, 1987)

participating in real communication.[28] These structural features are expressed in inferential relations, implicatures, presuppositional restrictions, etc. Moreover, given that semantic representations must capture those structural features from the flow of verbal communication, the unit of meaning for Kamp cannot be sentences, as in standard Tarskian semantics, but rather continuous sequences of sentences or discourses. Consequently, the theory is referred to as the Discourse Representation Theory (DRT). The first general claim of DRT is that structures available for interpretation must systematically reflect elements deriving from cognitive sources provided by the speaker.

DRT is clearly committed to truth-values as the semantic values of sentences and discourses.[29] The second important claim in DRT is that truth-values do not exhaust the linguistic meaning of discourses, nor, therefore, of the sentences involved in them. The following example characteristically employed by Heim (1982) illustrates this point. First, consider the truth-conditions of discourses (23) and (24) below.

(23) I dropped ten marbles and found them all except for *one*. It is probably under the sofa.
(24) ? I dropped ten marbles and found only nine of them. It is probably under the sofa.

Evidently the difference between (23) and (24) comes from the felicity of the anaphoric link in (23)—which is due to the presence of the antecedent *one* in the first sentence—and the infelicity of (24)—which is due to the absence of any available antecedent in the first sentence for the pronoun *it* in the second sentence. The question then is whether knowledge of truth-conditions of (23) and (24) can provide us with the explanation of that difference. Putting aside syntactic considerations, the sensible answer to this question above seems to be no because the truth-conditions of both sentences are clearly equivalent. That is, considerations about truth-conditions alone cannot constrain the

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[28] See Kamp (1984, 1985) and Kamp and Reyle (1993). Although Kamp's account follows cognitive lines, his views cannot be taken as supporting, as far as we can see, 'conceptualist' claims. However, see Asher (1993) for a strongly conceptualist view within a similar semantic framework.

[29] See Heim (1982), Kamp (1984), Kamp and Reyle (1993) and Asher (1993).

interpretations of the anaphoric linkage in (23) and in (24) and thereby explain differences in felicity in these sentences. It is also clear that the first sentence in discourse (24)—and its truth-conditions—can play a felicitous role in another discourse, for example, (25).

(25) I dropped ten marbles and found only nine of them. The missing marble probably is under the sofa.

This shows that other factors should be taken into account if the meaning of discourses as in (23) and (25) is to be represented in a systematic way. These factors, whatever they may be, should explain why and how speakers prefer to utter (23) or (25) instead of (24). Presumably, salience of the relevant objects in the environment of the speaker will count as one of such factors. However, others will need to be introduced as well. [30] For example, considerations about 'wording' seem to be needed.[31] These considerations deal with properties of the discourses—for instance, the presence or absence of definite or indefinite NPs—and their relation to the knowledge that hearers or recipients can infer from the utterance of the discourses—for instance, the familiarity or the novelty of the NPs for speakers. Clearly, such properties and relations are reflected neither in the semantic values provided by the **Ifs** nor in the syntactic outputs provided by LFs of the sentences in question. Thus, DRT assumes that the interpretation of a given discourse should clarify how contextual and cognitive factors determine the semantic representation of the discourse. These brief remarks about DRT, which we will revisit in chapter six, suggest how important the development of a solid view of the contribution

[30] In fact, examples (23) and (24) are used by Heim in order to defeat salience arguments put forward by Grice, Kripke and Lewis. S. Neale (1990, pp. 209–10) attempts to deny the effectiveness of the examples by means of an, in our opinion, unconvincing distinction between *syntactic* and *semantic* felicity. As he recognizes, there will be cases—for example, discourse (24) under determinate salience circumstances—which are considered semantically but not syntactically felicitous and which no one would accept as expressing anaphoric linkage.

[31] See Heim (1982, pp.21–2)

of context is to the speaker/hearer meaning. The following chapter will examine this crucial issue with respect to referential expressions and the sentences containing them.

CHAPTER II

REFERENTIAL NONSPECIFICITY AND SEMANTIC NONSPECIFICITY

Our goal in this chapter is to yield a set of arguments and definitions about nonspecificity supporting the background of our account of anaphora in the following chapters. The resulting background has both pragmatic and semantic roots. The pragmatic roots are based on an enriched Gricean view about meaning and reference. The semantic roots are based, mostly, on a general theory about non-univocality of meaning expounded by Pinkal. We willll argue that this background provides a natural solution to the problem of disambiguation of referring expressions, and the sentences containing them. The solution relies on appealing, in accordance with some Gricean theorists, to the notion of nonspecificity or indeterminacy and rejecting thereby the assumption of a literal ambiguity of the expressions. This manoeuvre gives rise to two levels of analysis in terms of nonspecificity: (a) the level dealing with the problem of referring expressions, i.e., the level of referential nonspecificity and (b) the level dealing with sentences containing referring expressions, i.e., the level of semantic or sentential nonspecificity.

2.1 Context, Types of Propositions and Referential Nonspecificity

The semantic account delineated in chapter one gives rise to a truth-theoretically interpreted system that is compositional in nature and predicts the meaning of a compound expression in terms of some function over the meanings assigned to its parts. Such meanings are defined relative to a clear-cut truth concept specified by the Tarskian recursive definitions B(1)-(6) in section 1.2. Also, we found there adequate motivation for having a syntactic counterpart of that system in the natural languages in so far as the syntax of such languages generates (via GB mechanisms) syntactic strings or LFs, which are directly interpreted by the structures assigned to them according to the Tarskian constraints (**lfs**). This direct correspondence has at least four interesting features, in addition to the ones considered at the end of section 1.2. First, the direct (and biunivocal) mapping allows us to define some important formal properties such as logical consequence and logical truth within a natural language. In fact, this objective has been the driving force behind most current work on truth-theoretic or model-theoretic semantics.[1] Secondly, in natural language semantics as defined above, interpretation is not context-sensitive. That is, it does not depend on the environment in which the utterance of a sentence occurs. This characteristic is above all, a consequence of the strict application of the Compositionality Principle.[2] Thirdly, the mapping is exhaustive, that is, there is no place for an ***intermediate*** level of representation. If this was not the case, the whole approach to natural language as sets of strings or formulae over which inference is directly definable should be given up or seriously modified. Thus, in this classical conception of the syntax-semantics interface, use of representations to talk about meanings of natural language sentences is just for convenience or simplicity as always we can dispense with them. Finally, dispensability of representations means that there is no need to appeal to psychological properties when approaching interpretation of natural languages sentences. In this view we can ignore cognitive and attitudinal properties and mechanisms that we spontaneously associate with hearers/speakers processing utterances of natural language sentences during verbal communication.[3] We shall call these four

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[1] Montague (1974), Davidson (1984)

[2] See Partee (1984), (1996) and Kempson (1996)

[3] We assume here the traditional distinction between a ***sentence*** and its ***utterance***. That is to say, as most authors, we associate truth-values with particular dated utterances rather than with sentences, which are abstract entities defined within a theory of grammar.

aspects, the ***orthodox conditions of the semantics-syntax interface***.

From a linguistic point of view, this thesis is focused on a kind of anaphora whose interpretation, as we are going to show in the next chapters, cannot be supported only by the classical account about what the syntax-semantics interface is. Consequently, we will explore those non-classical views of the interface that supplement or simply deny some or all of the orthodox conditions. In particular, we will examine the views related to the last three conditions, i.e. the ones having to do with context, representations and psychological properties. Since most semantic theories esentially committed to representations depend largely on theories about context-dependence and on theories dealing with cognitive aspects, we will deal firstly with the second and fourth condition and, after doing so, we are going to consider the third one. This decision implies that our examination must begin with some elements of pragmatics.

2.1.1 *Some definitions and three problems*

Stalnaker's commonly used definition of pragmatics suggests that pragmatics is the study of all linguistic acts and the contexts in which they are performed by language-users.[4] Thus, this study will include both speech acts and speech products, such as assertions, commands, counterfactuals, inferences, answers, etc., as well as features of the speech acts such as indexicality or deixis, presuppositions, etc. 'Context' here can be understood as encoding all the aspects that are physically, cognitively and linguistically relevant to the production and interpretation of actual utterances. Linguistic aspects encoded in sentences that are typically context-sensitive are, for instance, use of expressions like 'I', 'here' and 'now'. They are commonly referred to as 'contextual coordinates'.[5] We can call the definition above, ***the contextualist definition***. Despite some problems with the

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[4] Stalnaker (1972, p. 383)

[5] See Levinson (1983); notice that we are not commited here to the view that context is whatever, excluding semantics and grammar, contributes to interpretation of utterances.

contextualist definition,[6] most theorists feel some degree of sympathy to it and we do so too. Nevertheless, we acknowledge that the definition is incomplete. In other words, although it takes issue with the second orthodox condition, it remains rather silent about the fourth one, i.e. about psychological properties. We believe, as many theorist do,[7] that Grice (1989) was right in insisting that meaning properties are to be analysed ultimately in terms of psychological properties. Recanati clarifies this point by saying that "[s]entence meaning is to be analysed in terms of utterance meaning, utterance meaning in terms of communicative behaviour, and communicative behaviour, in terms of intentions and psychological states" (Recanati 1993, p. 20). Associated with such states, we would add cognitive properties and principles determining the conveyed information, for instance, computational mechanisms involved in inference, principles to retrieve and process information, and mechanisms by which referential information is presented to hearers and speakers, i. e., mechanisms involved in so-called 'modes of presentation' of the reference. Thus, pragmatics in our view crucially involves a psychological level of explanation. Kempson (1996) states clearly this viewpoint in the following terms:

> Pragmatics, ... , is the study of interpretation from the perspective of psychology, the study of the general cognitive principles involved in the retrieval of information from an uttered sequence of words. Its goal is to explain how from an uttered sequence of words, a hearer can suceed in retrieving some interpretation intended by the speaker, and then from that construal derive yet further information constituting the full import of the utterance. (Kempson 1996, p. 562)

We can call Kempson's definition, the ***psychological definition***. In agreement with other theorists (Kasher 1990, Sperber and Wilson 1986), we think that compatibility of the psychological and contextualist definitions is a natural consequence. Retrieval, processing and derivation of information from utterances is always context-sensitive, in the sense that utterances systematically depend on environment factors. Hence such psychological mechanisms are essential to context-dependent interpretations.

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[6] See Stalnaker (1972), and Levinson (1983).

[7] Recanati (1993), Neale (1990), among others

Furthermore, every linguistic act has psychological reality, in the sense that its interpretation (and rationalization) depends on the cognitive and attitudinal properties and mechanisms that we have to presuppose in hearers and speakers in order to make sense of verbal communication[8]. In the extreme, given this compatibility, context might be redefined simply as a psychological construct, i.e., the subset of hearer's assumptions about the world[9]. We will assume the compatibility between the psychological and contextualist definition as relatively uncontroversial in pragmatics.

The preceeding definitions suggest the main concerns and problems of pragmatics. We will explore three of these problems here. The first one has to do with the role played by context in the interpretation; the second one has to do with the way in which meanings are pragmatically captured. The last problem is related to disambiguation of context-dependent expressions. Since context aspects cannot be accounted for by reference to the truth-conditions of the sentences uttered, it seems that pragmatic explanations take place just when such aspects determine more than one interpretation of a sentence. In this case, we can say that the truth-conditions associated with the literal meaning of the sentences uttered ***underdetermine*** their interpretation. Obviously, when context aspects of the utterance do not play a significant role in the interpretation of the sentence we can say that the sentence is context-independent and, accordingly, its interpretation is ***univocal***, i.e., the meaning of the sentence corresponds just to its truth-conditions. This fact poses the natural question of how we should account for the contribution of context in determining the meaning of the utterance of a sentence, when the sentence gives rise to non-univocal interpretations. Several answers are available. For instance, one alternative is to appeal to something like an ambiguity analysis, positing several different interpretations in terms of different structure assignments for each syntactic string, having no role assigned to the context other than that of disambiguation.[10] Another radical

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[8] Grice (1975), Sperber and Wilson (1987a,1987b)

[9] Sperber and Wilson (1986, p.15)

[10] This the view assumed by Katz and Fodor (1963), and Katz (1973)

alternative consists in seeing context as omnipresent in every sentence. Thus, the meaning of every sentence is always specified only against a set of assumptions about the contexts in which the sentence could be uttered. This view can be labelled the 'no-null' context view.[11] Finally, intermediate alternatives are also possible. In such alternatives context plays a determinant role in the process of specifying the meaning of utterances but grammar features and knowledge of truth-conditions constrain to a certain extent the range of possible interpretations. As it will be clear in the following chapters, we will favour an intermediate stance.

Our intermediate position in the dispute about the nature of context-dependence is rather subservient to the answer that we are going to give to other more crucial question, at least for our purposes in the thesis. The contextualist and psychologist definitions imply, unlike semantics, that the goal of pragmatics is not to provide an assignment of form or structure to strings but explain how recovery of information from the uttered sequence of words takes place. Consequently, a major problem in pragmatics is not what form the recovered information might take, but how it is recovered. In Kempson's words the question that has to be asked is "how does the hearer choose which interpretation to select, given the range of representations she might in principle construct?" (Kempson 1996, p. 563). This question involves an equally important, but sometimes overlooked, problem, i.e., the question of whether the sole routes for recovering the information and determining the interpretation of an utterance of an expression are either via the linguistic meaning of the expression or via what is contextually communicated beyond the literal meaning of the expression. In what follows, I will briefly examine (1) the classical answer to the former question, i.e. Grice's answer or 'Grice's story', and (2) the positive answer that follows from the Gricean account to the latter question.

As demonstrated in several works (Grice 1975, 1989, among others), Grice implements a systematic account about how hearers determine the interpretation intended by the

[11] See Searle (1979)

speaker. Just in order to fix ideas before going to Grice's account, let us distinguish between the linguistic meaning of an expression, and the semantical value of a particular dated utterance of the expression. So, the semantical value of the utterance of a sentence is a truth value. The semantical value of the utterance of a referring expression, e.g. a proper name, is the referent of the expression. A characteristic of ***indexical*** expressions, i.e. expressions used for pointing like 'I', 'this', 'here', etc., is that their semantical value depends systematically upon the context of utterance. The distinction between linguistic meaning and semantical value allows us to explain the contribution that referring expressions make to the meaning of sentences containing them. For instance, if I utter the sentence 'I am British' right now, I am the referent of the utterance of 'I'. This will determine the semantical value of the whole sentence. If others utter the same sentence right now, the referents of the utterance of 'I' will vary and different semantical values could be assigned to the sentence. Thus, distinct utterances of 'I' may receive distinct individuals as their respective semantic values. However, it is rather obvious that such changes of reference will not alter the linguistic meaning of the expression(-type) 'I' from speaker to speaker, and, accordingly, the linguistic meaning of the sentence containing it. As Neale rightly stresses, "[t]o know the linguistic meaning of the word 'I' is to know something constant across utterances, roughly that the referent is the individual using the word. Similarly for 'you': the referent is the addressee (or addressees)" (Neale 1990, p. 68). Similar considerations will apply to demonstrative noun phrases and deictic expressions. Remarks of this kind gave rise long ago to the idea of identifying linguistic meaning of expressions with particular sorts of referential rules or functions that systematically take into account the context of utterance.[12] The linguistic meaning of an indexical expression will be a function from contexts to semantical values. The linguistic meaning of a sentence will be a function from contexts to propositions, i.e., a rule that determines, for every context, ***what is said*** by uttering the sentence in that context. What is said constitutes the ***proposition expressed*** by the utterance of the sentence. Accordingly, the proposition expressed coincides with the semantical value of the

[12] Strawson (1950), Montague (1968), Lewis (1970), Kaplan (1977).

utterance of the sentence. Finally, if we interpret definite descriptions along Russellian lines, i.e., as quantifiers and not as referring expressions, utterances of such descriptions will not take an object as their semantical value. The semantical value of an utterance of the sentence 'the F is G' will be a descriptive proposition to the effect that "there is one and only one thing that is F and that one thing is G. There is no object for which the grammatical subject 'the F' stands that is a genuine constituent of that proposition" (Neale op. cit , p. 72). Thus, the semantical value of the utterance of a definite description, under the Russellian reading, is an ***object-independent*** proposition expressed.

2.1.2 Grice's Story

In what follows we will expound schematically Grice's theory in three stages. In the first stage, we state the general basis of the theory; in the second stage, we examine the most relevant consequences (for our purposes here) drawn from the general basis for the notion of meaning; and, in the third stage, we discuss the consequences of Grice's account for disambiguation of utterances.

1. The general basis of the Gricean account is constituted by several Maxims of Conversation and an Implicature Theory. Maxims of Conversation that govern the selection of inferences in verbal communication, are in their turn governed by a general principle, the Cooperative Principle. The Cooperative Principle states that each participant engaged in conversation will attempt to contribute appropiately to the current exchange of talk at the required time and according to the accepted purpose of that exchange. This means that the main characteristic of conversation, according to Grice, is being a cooperative and purposeful enterprise. Under this general principle, Grice subsumes four Maxims, which dictate that speakers/hearers should conform to standards of truthfulness, informativeness, relevance and clarity. These Maxims are Maxims of Quantity, Quality, Relevance and Manner, respectively. The other contribution to pragmatics of Grice's theory is the idea that some occasions of apparent flagrant violation of the Maxims constitute the basis whereby genuine pragmatical inferences, called

'conversational implicatures', are derived. For example, answering 'An apple is an apple' when, in the middle of their lunch hour, a man asks another how he likes the apple he is eating, seems a flagrant violation of, at least, the Quality Maxim. Pointless sentences like the one above are called tautologies and have no interest but for logicians. However, if they are used in actual conversation, it is clear the speaker intends to communicate through them more than is said. When the hearer receives the answer 'An apple is an apple', he first has to assume that the speaker is being cooperative and intends to communicate something. Accordingly, that something must be more than only what the words literally mean. This is an additional conveyed meaning; in Grice's terminology, the conversational implicature that the speaker is intending in the talk exchange. In the sentence above, the speaker expects that the hearer will be able to work out or ***derive***, on the basis of what is already assumed in the utterance context, the implicature intended in the context, for instance, that the speaker thinks all apples are the same or that he has no opinion about apples. Depending on other context factors, additional implicatures might be inferred.

Furthermore, Grice took special care to specify and distinguish several sorts of implicature. The example of conversational implicature given above corresponds to a ***particularized*** conversational implicature, i.e. an unstated meaning that essentially requires of the context to be inferred. However, maybe the most important sort of implicature for philosophers of language is what Grice termed ***generalized*** conversational implicature. The main characteristic of the latter kind of implicature is that the derivation of its unstated meaning does not depend on special or local knowledge of context factors. For instance, one can note that in general whenever someone says 'I walked into a house' she shall be taken to implicate 'The house was not my house'. It is difficult to diminish the importance of this kind of implicature when one realizes that it allows us to explain why, given the utterance of a particular expression, we always infer an unstated meaning and why we do so quite independently of the utterance context. For instance, we might explain why whenever a speaker utters something like 'some Fs are Gs' hearers end up inferring (but not logically implying) something like 'some Fs are not Gs'. [13] In conclusion, we can say that a speaker conversationally implicates (whether via particularized or generalized implicatures) that which must be assumed to believe in order to preserve the assumption that she is adhering to the Cooperative Principle and Maxims.

2. We turn now to some consequences that Grice's theory of conversation has for a theory of meaning. They can be summarised in the following statement: there are speech acts, in particular, conversational implicatures[14] that belong to what an utterance communicates in a relevant way, determining thus propositions other than the proposition strictly and literally expressed by the utterance. That is to say, a speaker may express a particular proposition by using an utterance of a sentence whereas at the same time communicating something beyond the proposition expressed. Thus, we can intuitively distinguish between the proposition expressed on an utterance ocassion and the proposition (or propositions) conveyed by the utterance, i.e., the proposition (or propositions) ***meant***. In our example of apples above there is no systematic way of correlating the proposition(s) meant (for instance, 'all apples are the same' or 'I have no opinion about apples') with the proposition expressed by means of the utterance of the sentence. The latter proposition is determined by the linguistic meaning of 'An apple is an apple', which is based on the meaning of its parts and their syntactical arrangements, together with the context factors accompanying the utterance. In contrast, it is clear that the proposition meant by the speaker's utterance communicates something entirely different.

By using the terminology fixed above, we distinguish three different notions in talking about the meaning of a sentence S as uttered by a speaker on a given utterance *u*: (i) the

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[13] See Neale (op. cit., pp. 81-2).

[14] In Grice's theory one can also find ***conventional*** implicatures. They arise regardless of context and depend to a great extent on linguistic conventions. For instance, the difference between 'P and Q' and 'P but Q' consists in the contrast introduced by 'but' in the second compound sentence. So 'constrast' is a conventional implicature of 'but'. Also, unlike conversational implicatures, conventional implicatures are not derived from Maxims; see Levinson (1983).

linguistic or literal meaning of the sentence S; (ii) the semantical value of S relative to the context of utterance, i.e. the proposition expressed by the utterance *u* of S by the speaker; and (iii) what the speaker meant by uttering S, i.e. the proposition(s) meant by *u*.[15] With this distinction, it becomes straightforward that the level of what is said, i.e., the level of the proposition expressed, provides the (literal) truth-conditions of the utterance. Such truth-conditions are therefore the result of the linguistic and conventional meaning of the sentence plus the context of utterance. Given that in many cases (presumably, the simplest ones) the proposition expressed will coincide with the proposition meant, one can ask the question of whether it is possible, within the present framework, to characterize when a proposition is ***meant***. The answer to this question is important by at least two reasons: first, it will provide a characterization of meaning in terms of communication proper; and, second, that characterization will also provide us with an initial answer to Kempson's question above about the selection of interpretations for a given utterance.

The following definition taken from Grice (1957, 1975) offers a characterization of the expession 'a speaker ***s*** means that ***p*** by uttering S' :

(1) By uttering S, ***s*** means that ***p*** if and only if for some recipient H, ***s*** utters S intending:
(i) H to entertain the thought that ***p***, and
(ii) H to simply recognize that ***s*** intends (i)

(1), with some simplifications, defines what Grice calls ***non-natural meaning*** or ***speaker-meaning***. The success of communicating a proposition by a speaker lies in the recognition (on the hearer side) of a complex intention, the intention of entertaining that proposition. Such a success in the communicative intention will therefore determine which interpretation (which proposition meant) of the available range of interpretations will be selected, beyond the literal meaning of the utterance. For the time being, we will not be concerned with intentions. Nonetheless, the final part of the Gricean story, i.e. Grice's explanation of disambiguation, will be vital for our concerns in this dissertation.

[15] See Neale (1990), Recanati (1993).

3. As Grice suggests,[16] since the proposition meant includes a pragmatic, non-conventional element, i.e., a conversational implicature, the fact that a given expression may receive different interpretations—for Grice, 'senses' or 'meanings'—in differents contexts does not imply that it is semantically ambiguous. Earlier we call the general phenomenon of receiving different interpretations, the non-univocality of an expression; thus, we can consider Grice's talk about different senses, meanings or interpretations as directly dealing with that general phenomenon. It is a common practice to account for intuitive differences in meaning or non-univocality at the semantic level, by positing two or more different literal meanings, that is, by positing a ***semantic ambiguity***. However, with Grice's theory, it is also possible to account for the same differences at the pragmatic level by positing a conversational implicature that, in some contexts, interacts with what is literally said. Grice was particularly concerned with explaining alleged ambiguities of some logical connectives by applying his account of generalized conversational implicature. A case in point is the exclusive and inclusive readings of the particle 'or'. Grice argues that instead of claiming that 'or' is in two ways ambiguous, we may consider it as unambiguously inclusive and account for the exclusive reading by saying that in some contexts the utterance of the sentence 'P or Q' conversationally implicates that 'P' and 'Q' cannot both be true. Grices draws an immediate methodological moral of his explanation of these alleged ambiguities: if a putative ambiguity (a non-univocality of interpretation, in our terms) can be accounted for either at the semantic level, by assuming two different literal meanings or senses, or at the pragmatic level, by assuming a conversational implicature, the pragmatic option is to be preferred. This moral follows from suscribing to what Grice calls ***Modified Occam's Razor***: ***Senses are not to be multiplied beyond necessity***. Recanati (1993) justifies the plausibility of this principle as follows.

> This is a principle of theoretical parsimony, like Occam's Razor. Pragmatic explanations, when available, are to be preferred because they are economical, in the sense that the principles and assumptions

[16] Grice (1989 pp.47-48)

> they appeal to are very general and independently motivated. By contrast, positing a semantic ambiguity is an ***ad hoc***, costly move —a move which the possibility of a pragmatic analysis makes entirely superfluous (Recanati 1993, p.234)

And as Neale (1990) remarks, preferring pragmatic explanations over semantic ambiguities brings as a bonus an increase in generality. Or, conversely, the loss of generality by positing several literally distinct readings can be considerable. So, it seems that we have to concede to Grice that "where semantical and pragmatic accounts handle ***the same range of data***, the pragmatic account is preferable" (Neale op. cit., p. 81)

2.1.3 *Grice's story and the problem of disambiguation: the referential challenge*

Grice's story provides us direct answers to the three problems stated earlier.

(I) *The problem of context-dependence*: Context is decisive in interpreting utterances but it is not everything. Although linguistic meaning conventionally determines what is literally said and therefore the truth-conditions of the utterances, linguistic conventions and linguistic usage may, at least in part, participate of what is communicated, i.e. they may participate of (and contribute to) the proposition meant. The best examples of that possibility is the presence of generalized conversational implicatures and conventional implicatures in communication. This shows that Grice's account leads to something like an intermediate stance in the debate about context-dependence.

(II) *The problem of speaker meaning*: Grice's whole theory of conveyed meaning (or speaker-meaning) yields an impressive solution to this question. This theory shows how capture the meaning or interpretation intended by a speaker in conversation and appeals explicitly to mechanisms and principles that guarantee the inference and prediction of that intended meaning. Also, and equally important, the theory has an undeniable psychological basis provided by its crucial use of the intentions of the speaker to explain communicative success. Thus, in principle, Grice yields a cogent answer to our worries about psychological features in pragmatic explanations.

(III) *The problem of disambiguation*: Grice's recommendation when faced with non-univocal interpretations of utterances and where semantic and pragmatic explanations of disambiguation are at odds is that we must apply the Modified Occam's Razor. In such a case, the pragmatic option is the favourite one. But in turn this methodological moral implies that we have two exhaustive alternatives: genuine ambiguity or implicature. If we favour genuine ambiguity, disambiguation will take place at the level of linguistic meaning as the singled out interpretations will correspond to different literal meanings. If we favour implicature, disambiguation will occur at the level of the proposition meant or conveyed (whatever the implicature involved) and, consequently, no assumption about distinctive literal meanings is needed.

To be sure, this story has much to commend it on all counts and its contributions to the renewal of pragmatics are unquestionable. Despite that, over the last two decades several potential shortcomings and limitations of Grice's theory have been acknowledged.[17] Subsequent improvements to Grice's theory have been offered, Sperber and Wilson's theory (1986) being the best well-known. Sperber and Wilson stress the cognitive angle within a theory of communicative intentions. Unlike Grice, they propose that not all maxims are at the same level. They convincingly argue that ***relevance*** is the core of a theory of communication in so far as communicating is just communicating relevant information. Accordingly, they approach relevance in the following comparative way: the greater the contextual effects (the inferences resulting from interaction between old and new information) yielded with the least possible processing effort, the greater the relevance.[18] Here, relevance is defined as achieving an optimal balance between the cognitive effort involved in processing and richness of contextual or inferential effects. Implicatures (and disambiguation) can be characterized as contextual effects, provided optimal relevance exists. The *Principle of Relevance* stipulates what choice of interpretation or meaning from a set of potential intended interpretations will be the correct. Such a choice will be the result of applying a constraint according to which the least effort of the hearer is needed in order to infer an interpretation that the speaker

[17] For a review of criticisms, see Horn (1988)

[18] Sperber and Wilson (1986, p.125)

could have intended. Although the constraint of relevance guarantees the correct interpretation, it is worth emphasising that, according to Sperber and Wilson, its goal is to restrict cognitive representations that are "mental objects that never surface to consciousnes" (Sperber and Wilson, 1986, p. 193). Such representations become mentally represented as "a result of an automatic and unconscious process of linguistic decoding" (Sperber and Wilson, op. cit., p. 193). Consequently, when, by means of the smallest search in the cognitive space, one representation is made explicit, we say that it had a contextual effect, i.e. its corresponding interpretation has been obtained. We are not interested to say anything more substantive about Sperber and Wilson's theory here. However, we think that combination of the implicature theory and the relevance theory provides the best cognitive background behind pragmatic explanations of linguistic phenomena. From here forward, each time we refer to these explanations, we shall presuppose such a cognitive background.

Exploring further other potential defects of Grice's approach is obviously beyond the goals of this thesis. However, given that our concerns here are closely related to non-univocality issues, we will carefully examine the solution that Grice offers for the disambiguation problem. We believe that although Grice's story is initially atractive there is another richer story to be considered. In particular, this new story shows that it is a mistake to argue that there are only two possible levels in which disambiguation takes place.

Before examining the arguments against Grice's classical theory let us first check an striking example of how successful the application of that theory can be. The example is related to the problem of the definite description usage, which involves important consequences for elucidating the anaphora phenomena to be discussed in the next chapters. S. Neale (1990) has provided what is perhaps the most complete and cogent solution to the problem of the definite description usage based on a Gricean background. This solution gives a sound reason to focus on it. In addition to that reason, many things that Neale says about definite descriptions bear explicitly on issues about anaphora.

Therefore, it is important to evaluate his solution in order to clarify our own arguments.

Neale's goal is to rebut the so-called 'referential challenge' posited by some theorists to Russell's account of definite descriptions, i.e., expressions of the sort 'the *F*'. According to Donnellan (1966), several philosophers have inclined to distinguish between two uses of definite descriptions, the ***attributive*** and ***referential***. For instance, in a sentence like 'Smith's murderer is insane', Donnellan observed two possible interpretations: the one in which we make a descriptive reference to whoever was the (unique) murderer of Smith, and the other in which we make an objectual reference to a certain individual, say, Jones, who is known to have murdered Smith. Thus, on the attributive interpretation, what is said is true if and only if there is one and only one person who murdered Smith and he or she is insane. On the referential interpretation, the utterance is true if and only if Jones is insane. As Recanati (1993) remarks about this interpretation, Jones's being the murderer of Smith is no more part of the truth-condition of what is said, than my being the speaker is part of the truth-condition of what I say when I utter the sentence 'I am insane'.[19] It is clear that Russell's quantificational analysis of definite descriptions yields an accurate account of the proposition expressed on the attributive reading. However, in the referential case, the descriptive phrase "functions like a referring expression not a quantifier phrase, and the proposition expressed is not faithfully captured by Russell's quantificational analysis" (Neale op. cit. p. 64). Therefore, the proposition expressed is ***object-dependent***. On this view, the only defense is that there is a semantically distinct referential reading of definite descriptions. Consequently, this implies the defense of the view that "descriptions are ***semantically ambiguous*** between Russellian and "referential" interpretations, i.e., [that] the definite article is lexically ambiguous" (Neale, op. cit., p. 65).

As Neale recalls, as early as 1969, Grice suggested that there is no systematic ambiguity of meaning involved in the use of definite descriptions. One, according to Grice, just

[19] Recanati (1993, p. 238)

needs to invoke an independently motivated distinction between what a speaker says and what he or she means, i.e, between the proposition expressed and the proposition meant. [20] Thus, in Grice's view, the Russellian account delivers the correct analysis of descriptions. Neale implements more clearly this view claiming that the Russellian is right to endorse the following schema:

(**Des**) If a speaker S uses a definite description 'the *F*' referentially in an utterance *u* of 'the *F* is *G*', 'the *F*' still functions as a quantifier and the proposition expressed by *u* is the object-independent proposition given by [the x: *F*x](*G*x)

The Russellian-Gricean sees referential usage "as an important fact about ***communication*** to be explained by general pragmatic principles [and] not something of ***semantical*** import" (Neale op. cit., p. 85). In particular, (**Des**) entails that the same proposition is expressed on both readings, i.e. the general proposition that there is an x such that x is uniquely *F* and is *G*. Consequently, disambiguation of readings occurs at the level of the propositions meant. As a matter of illustration, let us consider the sentence in (2) below.

(2) The Editor of ***Linguistics and Philosophy*** is coming to London next Saturday

On the one hand, if the utterance context determines that the description is used by both a speaker and a hearer to refer to, say, Harry Smith, then, by using (1) above, we obtain the following explanation of that referential usage: the speaker utters (2) intending the hearer (i) to actively entertain the (object-dependent) proposition that Harry Smith is coming to London next Saturday, and (ii) to recognize that the speaker intends the hearer to actively entertain that proposition. This way, Neale adds, "[t]here would appear to be no barrier, then to saying that (part of) what [the speaker] ***mean***[s] by [her] utterance of [(2)] is that Harry Smith is coming to [London] next Saturday; the object-dependent proposition that Harry Smith is coming to [London] next Saturday is (one of) the ***proposition(s) meant***" (Neale op. cit., pp.85-6). On the other hand, if the utterance

[20] Grice (1969, p. 143)

context makes it clear that the description is attributively used, i.e., neither the speaker nor the hearer have any relevant context-dependent information about a singular object satisfying the description, then the proposition expressed is the general proposition to the effect that whoever is uniquely F is G. The general proposition literally expressed is relevant independently of any contextually implied singular proposition, and this is what is communicated by the utterance. In conclusion, referential readings do not give rise to any literal or lexical ambiguity. They are just cases in which the speaker communicates not only the general (or object-independent) proposition which is literally expressed, but also the singular (or object-dependent) proposition which is contextually implicated and which gives the utterance its point. Neale's final conclusion clearly states how the Russellian overcomes the referential challenge:

> We have reached the situation, then, in which we appear to have a perfectly good explanation of referential uses of definite descriptions that does not appeal to any sort of semantical ambiguity. The Russellian and the ambiguity theorist agree that when a description is used referentially, (one of) the proposition(s) ***meant*** is object-dependent; they just provide different explanations of this fact. The referentialist complicates the semantics of 'the'; the Russellian appeals to antecedently motivated principles governing the nature of rational discourse and ordinary inference. [...] But general methodological considerations lend support to the Russellian. Modified Occam's Razor enjoins us not to multiply senses beyond necessity, i.e., to opt for a theory that (***ceteris paribus***) does not have to appeal to a semantical ambiguity. (Neale, op. cit., p.90)

It is worth noticing that Neale's conclusion is endorsed by many theorists (working from often divergent perspectives) and that it has gained increasing support over the last few years. There are at least two relevant reasons for that favourable opinion. The first reason is that the phenomenon of referential usage is not something peculiar only to the definite article. Given appropriate contexts, we can get similar usages for the indefinite article 'a' as well.[21] Even more, as Sainsbury (1979) has rightly emphasised, it is not difficult to show that sentences containing all kinds of quantifiers (for instance, 'everyone', 'some',

[21] See Neale (op.cit, p. 87)

'many', among others) may be used to convey object-dependent propositions. This considerably weakens the case for genuine ambiguity in the definite article and leads, by contrast, to keep the semantics of all quantifiers as simple as possible. In addition, it yields further motivation to prefer a pragmatic treatment of most cases of non-univocality in discourse.

The second equally important reason is the fact that Russell's quantificational analysis of descriptions, as carefully showed by Neale, has wide and successful applications beyond sentences containing simple descriptions. For instance, it might deal with sentences containing descriptions with relative clauses, relativized descriptions, and descriptions embedded in genitive structures. More important for our purpose, the Russellian theory, in Neale's hands, can be applied to pronouns ***bound and unbound*** by descriptions thus contributing decisively to the construction of a general theory of anaphora.[22] We shall say a lot more about Neale's theory of anaphora in the following chapters though, the aforementioned applications yield enough motivation for us to feel sympathy for Neale's conclusions about 'the *F*'. However, we believe that there are good reasons to feel otherwise regarding some premises of Neale's argument. In particular, we think that the use of the implicature theory to explain disambiguation does not fit in with a pervasive feature of non-univocality that is directly involved in the discussion relative to the referential challenge, i.e. the ***underspecification*** or, expressed with the term that mostly we are going to use from now on, the ***nonspecificity*** of meaning.[23] We believe that nonspecificity or underspecification is not only a context-dependent issue, subject to an analysis exclusively in terms of what is communicated or, in other words, in terms of conversational implicatures. In our opinion, non-trivial (non-lexical) cases of underspecification involving quantifiers and relations between quantified phrases require

[22] Neale (op. cit., pp.46-7)

[23] We are going to use 'nonspecificity', 'underspecification', 'underdetermination and 'indeterminacy' to mean the same. Nevertheless, from a semantic point of view, we distinguish them clearly from vagueness and, of course, ambiguity; see the section 2.2. Also, for some problems with indeterminacy and underdetermination see note 27 in this section.

a different analysis, wherein the source for disambiguation is crucially provided by the interaction between the level of linguistic meaning (with its corresponding truth-conditions) and the level of what is said. Consequently, Russell's conception of definite descriptions defended by Neale will also have to be adapted to such an analysis if we want to preserve all of its advantages. Thus, we are going to look at an alternative solution to the referential challenge that meets the following ***desiderata***: (a) to provide for the problem of the referential challenge an adequate pragmatic rather than semantic solution, (b) to explain disambiguation in terms of nonspecificity or underspecification without relying on conversational implicatures, and (c) to preserve, in explaining disambiguation, the additional major characteristics of the Gricean account.

2.1.4 *A new pragmatic story of disambiguation*

Several authors (Bach (1987), Atlas (1989) and Recanati (1989, 1993)) have been concerned with offering a different solution to the referential challenge. In our opinion, Recanati's solution is the only one thoroughly committed to satisfy the desirata above and therefore we shall examine it in detail. At the end of our examination, it shall appear necessary to complete Recanati's new story by distinguishing between nonspecificity of referential-attributive uses and nonspecificity of the reference itself. In order to substantiate the latter notion, we shall introduce some ideas taken from Bach (1987) and bearing on the relationship between speaker/hearer reference and nonspecificity.

In order to clarify Recanati's position about the problem with the implicature analysis let us quote the following long paragraph.

> The Gricean picture [...] has been enormously influential and rightly so; but it raises a problem which has been recognized only recently. The problem is connected with the notion that sentence meaning conventionally determines what is said. Grice is aware that what is said depends not only on the conventional meaning of the words but also on the context of utterance. What is said by uttering 'I have not had breakfast today' depends on who is speaking

> and when. That is why there is a difference between the conventional meaning of words and what is said by uttering the words. The conventional meaning of the words only determines, or helps to determine, what is said, according to Grice. But what does it mean? (Recanati 1993, pp. 234-5)

As we saw earlier, the common answer to the last question is that the linguistic meaning of a sentence is a function from contexts to propositions. Similar definitions will apply to referring expressions like 'I' and 'you'. Under this account, context decisively contributes something to determine meaning. Nevertheless, as Recanati remarks, "recourse to the context of utterance is guided and controlled by the conventional meaning of the words" (Recanati op. cit., p. 235). So the meaning of 'I' (the person who is speaking) provides us with an identifying clue taken from the context of utterance and leads us to fully identify what is said. In other words, once the context is specified, what is said can be automatically decoded.

Recanati reacts to this view by showing that even if we supply all the relevant contextual information (identification of the speaker, hearer(s), time etc.) "the conventional meaning of the words falls short of supplying enough information to exploit this knowledge of the context so as to secure understanding of what is said" (Recanati, op. cit., Ibid). A simple example given by Recanati is the sentence 'He has bought John's book'. Recanati contends that, apart from gender information, the meaning of 'he' provides no criterion enabling one to identify the reference. Consequently, the meaning of the sentence in question, to a great extent underdetermines what is said. Also, according to Recanati, this underdetermination is not limited to the reference of referring expressions in the sentence in question. In his words,

> [t]o understand what is said by 'He has bought John's book', one must identify the referent of 'he', of 'John' and (perhaps) of John's book. But one must also identify the relation that is supposed to hold between John and the book. According to Kay and Zimmer [(1976)] [...], 'genitive locutions present the hearer with two nouns and a

metalinguistic instruction that there is a relation between these two nouns that the hearer must supply'. 'John's book' therefore means something like 'the book that bears the relation x to John'. To understand what is said by means of a sentence in which the expression 'John's book' occurs, this meaning must be contextually enriched by instantiating the variable 'x'" (Recanati op.cit., pp.235-6).

Furthermore, the descriptive sense of the expression 'John's book' is also context-dependent and there is no rule taking us from the context to the relevant semantic value. Recanati concludes that context-dependence is generally 'free' rather than 'controlled', in the sense that "the linguistic meaning of a context-sensitive expression constrains its possible semantic values but does not consist in a 'rule' or 'function' taking us from context to semantic value " (Recanati op. cit., p. 236).

Recanati's objection above, far from posing a threat to Grice's theory, can be implemented within the latter thus obtaining an enriched theory of speaker meaning. The enriched theory points towards the necessity of a pragmatic explanation of the step from sentence meaning to what is said. Recanati shows in detail how the Gricean implicature apparatus yields the desired explanation.[24] Nevertheless, once the Gricean theory is enriched and we try to explain ***prima facie*** ambiguities, the option between the semantic ambiguity theory and the pragmatic implicature theory that Grice's classical theory assumed becomes questionable. As we saw, these two alternatives corresponded to two basic levels of meaning distinguished in the classical Gricean story: sentence meaning, which determines what is literally said, and the utterance's overall meaning, which determines what is communicated (including what is said and the implicatures). According to Recanati, if we distinguish three levels of meaning rather than two—sentence meaning, what is said, and what is communicated, it follows that there would be three ways of accounting for ***prima facie*** ambiguities.

Besides the semantic approach, which locates the ambiguity

[24] Recanati (op.cit., p. 236)

> at the first level, that of the sentence meaning, there are two pragmatic approaches corresponding to the second and third levels of meaning [...]. The classical Gricean approach considers that is the same on all readings of the 'ambiguous' utterance, the difference between the readings being due to a conversational implicature which, in some contexts, combines with what is literally said. The other pragmatic approach considers that the difference is a difference in what is said, even though the sentence itself is not ambiguous; this is possible owing to semantic underdetermination of what is said (Recanati op. cit., p. 237)

Of course, Recanati's point is not that Modified Occam's Razor supports the conversational implicature approach as against the other pragmatic approach but rather that a pragmatic approach ***is to be*** preferred, ***ceteris paribus***, to a semantic approach.[25]

The above argument bears immediately on the problem of the referential challenge. The pragmatic answer that Recanati is going to give to that challenge is termed by him ***the indeterminacy theory*** (Recanati 1989, 1993). If we initially translate 'indeterminacy' as 'nonspecificity',[26] then Recanati's theory seems to imply that the problem of non-univocality posited by the two potential readings of the definite article is not a problem of ambiguity but of nonspecificity or underspecification. And, consequently, 'disambiguation' of nonspecific expressions is a problem of pragmatics and not semantics. We are just going to touch on Recanati's solution as our interest is put on the methodological conclusions rather than on the argument itself. Recanati's solution is motivated by a distinction to be drawn at the level of what is said between the proposition

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[25] Recanati (op. cit., Ibid.)

[26] We say 'initially' in this context as, in strict sense, indeterminacy cannot be equated with underdetermination and, therefore, with underspecification. In our opinion, underdetermination is an issue relative to context information alone whereas indeterminacy is a more general notion embracing, for example, indexicality, and vagueness. So, perhaps it would be better to equate indeterminacy with general non-univocality. Nevertheless, in the context of Recanati's theory, it seems clear that indeterminacy is used to mean something like nonspecificity or underdetermination only.

expressed and the ***external*** proposition.[27] The external proposition associated with the utterance of a sentence consists in indications "under which ***any*** utterance of this sentence would express a true proposition [...]. These conditions are invariant under contextual change, while the proposition expressed by the utterance, and therefore its truth-conditions, generally depend on the context" (Recanati op. cit., p. 289). Let us consider that a token T of the sentence 'I am Chilean' has been actually produced. Since we know the (linguistic) meaning of the sentence, we automatically know what can be called the ***external truth-conditions*** of T (even, Recanati stresses, if we do not know what the context of utterance looks like). A token T of the sentence 'I am Chilean' expresses a true proposition if and only if someone utters T and he or she is Chilean (at the time of utterance). The right-hand conditions of the biconditional correspond thus to the external proposition. One realizes that those conditions differ from the ones of the proposition expressed if one abstracts from the context and relies only on the linguistic meaning of T. Therefore, it is impossible to say which proposition is expressed because indeed without a context no proposition can be expressed. Once the context is taken into account, it turns out that T expresses the proposition that, for example, Isabel Allende (the supposed utterer of T) is Chilean. In terms of possible worlds, that proposition can be then described as the set of worlds in which Isabel Allende is Chilean. By contrast, the external proposition of T tells us that it expresses a true proposition if and only if there is an x who utters T and who is Chilean (at the time of utterance). No utterance context knowledge needs to be invoked to establish that proposition. This explanation has the following methodological limitation: the external proposition embraces all conditions under which the utterance of a sentence expresses a true proposition, but it is impotent to tell us which of these conditions are contextual conditions, and which are truth-conditions proper.

According to Recanati, given the difference between proposition expressed and external proposition, the question 'What is the meaning of 'The *F* is *G*'?' loses much of its

[27] Stalnaker uses the expression 'diagonal proposition' instead of 'external proposition'; see Stalnaker (1978). See also Perry (1988) for something similar to the notion of 'external truth-conditions'.

philosophical perplexity. The implicature theorist is right in insisting that the (conventional) meaning of this sentence involves the general proposition that there is a unique *F* and that it is *G*. However, contrary to what the implicature theorist claims, it can be shown that this proposition is not the proposition expressed but only the external proposition. Given that at the first level of what is said the utterance of the sentence 'The *F* is *G*' ***externally*** expresses the general proposition in question, it is not difficult to explain why, at the second level, this sentence can express either a general or a singular proposition. Due to the methodological limitation already indicated, the external proposition of the utterance of 'The *F* is *G*' tells us that such an utterance expresses a true proposition if and only if there is an x such that it is uniquely *F* and x is *G*. Nonetheless, the external proposition cannot tell us whether the condition that there be an x such that x is uniquely *F* is a contextual condition or a truth-condition proper. Here is Recanati's complete explanation of how then, under these conditions, disambiguation is possible.

> It follows that there are two posible interpretations, according to the context: in one type of context, the condition that there be an x such that x is uniquely *F* will be interpreted as a contextual condition, and the proposition expressed will be a singular proposition, true if and only if *a* (the object which satisfies the contextual condition) is *G*. In another type of context, the condition that there be an x such that x is uniquely *F* will be considered as a full-blooded truth-condition, and the utterance will express the general proposition that there is an x such that x is uniquely *F* and x is *G*.
> (Recanati op. cit., p.291)[28]

Even though we cannot give all the details here, indeed it would be unfair to accuse Recanati's disambiguation treatment of reducing the analysis of referentially used descriptions to an analysis of indexicals and demonstratives.[29] In such a case, no relevant difference could be drawn between, for instance, sentences like 'The present speaker is Chilean' (where the description is referentially used) and 'I am Chilean'. However, as

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[28] For more detail on this argument, see Recanati (1989).

[29] Neale (1990, pp.110-113) makes wrongly this charge. Neale's account of Recanati's theory completely ignores within the latter the crucial distinction between the proposition expressed and the external proposition.

Recanati carefully shows, this is not the case. Recanati's theory enables us to straighforwardly explain why "the indeterminacy which characterizes description-sentences and makes them capable of two readings does ***not*** transfer to sentences in which a referential term occurs instead of a description" (Recanati op. cit., p. 292).[30]

We believe that the Gricean enriched story constructed by Recanati meets completely the desiderata indicated earlier. First, we now have a convincing pragmatic explanation, embracing all the relevant data. Hence, a pragmatic explanation to be preferred over any semantic competitor, in accordance with Modified Occam's Razor. Second, Recanati's solution explains disambiguation in terms of the relation between the level of linguistic meaning and the level of the proposition expressed. In such an analysis, external truth-conditions play a crucial role determining the meaning of the sentence (its external proposition) for any possible situation or world and beyond the particular context of utterance. Due to their externality, such truth-conditions keep the sentence indeterminate. What disambiguates the sentence is the provision of an actual context of utterance at the level of what is said. However, at that level, the proposition expressed is free, that is, it is not totally controlled by the linguistic meaning of the utterance, in the sense that the latter does not take us from a context to a proposition. It just underdetermines what is said. Third, the enriched theory retains, with some modifications, several important tenets of Grice's theory, for instance, the three levels of meaning, the idea that conversational implicatures are part of what is not literally expressed etc. Finally, even though Recanati rejects some principles and processes underlying Grice's account of the pragmatics of what is said, he takes special care to replace those principles with other cognitively-orientated ones.[31]

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[30] In his (1993), Recanati has implemented a new solution for the disambiguation problem, which he calls ***the Synecdoche Theory***. Although this is a non-Russellian theory, it preserves most advantages of the Indeterminacy Theory—in particular, the idea that the problem of non-univocality of readings of the definite article is, in fact, a problem of nonspecificity and not of semantic ambiguity—and also allows us to deal with a recalcitrant difficulty of descriptions, the 'functional' uses of descriptions, i.e., uses like the one in the sentence 'The president changes every four years').

[31] Recanati op. cit., chapter 14 and Appendix.

Recanati's theory seems attractive enough as a basis to explain in terms of nonspecificity the non-univocality generated by descriptions in different contexts, and—if Neale and others are right on usage of quantifiers, the non-univocality of quantifiers and quantified phrases in discourse. Also, since our explanations of the anaphoric phenomena to be examined in the following chapters will involve interpreting such phenomena in terms of nonspecificity, it must be clear that we are going to take quite seriously Grice's enriched story as a background for our explanations. This implies that in our analyses of non-univocal interpretations of anaphoric sentences, disambiguation will mostly be based on the level of what is said rather than on the level of what is communicated. Also, our analyses will presuppose the concepts of external proposition and external truth-conditions, as expressing the conventional meaning of a sentence. Therefore, the interpretations or specifications that we are going to obtain for the anaphoric sentences will be the result of interaction between literal truth-conditions and contextual conditions, in a close parallel with the disambiguation of ***prima facie*** attributive-referential ambiguities.

2.1.5 *Completing the new story: nonspecificity of reference*

Nonspecificity or underspecification is a phenomenon that has just recently gained recognition among pragmatists and semanticists. Semanticists have been seriously concerned with the problem of representing quantificationally underspecified sentences. [32] Pragmatists have, in their turn, focused on several issues, being perhaps the problem of the disambiguation of reference the most discussed one. Recent discussions about the nature of the uses of all kinds of referring expressions, invoke notions such as underspecification, nonspecificity or underdetermination (Sperber and Wilson (1986), Bach (1987), Atlas (1989), Recanati (1993)) in order to provide empirically adequate explanations. Most theories dealing with reference of the speaker accept that non-univocality of a referential expression is a manifestation of nonspecificity or underspecification. Nevertheless, insofar as these authors have refined their views, they

[32] See van Deemter and Peters (1996)

have realized that recognition by the hearer of the intended meaning by the speaker is sometimes less transparent than expected, despite obtaining communicative success. The sentences below (sentence (2) was already discussed) can illustrate the point.

(2) He has bought John's book.
(3) He saw the man who Jones was after.

As we have seen, the literal meaning of the referring expressions contained in the sentences (2)-(3) underdetermine their interpretation. Thereby, according to Recanati, it is evident that just at the level of what is said the hearer can recognize and capture the intended meaning by the speaker. That is, recognition of meaning is possible if and only if, in the case of (2), the hearer has identified the referents of 'he', 'John', 'John's books' and, according to Recanati, the relation that is supposed to hold between John and the book. In the case of (3), if and only if the hearer has identified the referents of 'he', 'Jones', 'the man who Jones was after', and, presumably, the relation holding behind 'Jones was after [the man]'. Once the hearer obtains the required identifications, the referents intended by the speaker are recognized and the meaning of the utterances inferred. This suggests that, on the hearer side, successive recognition of the meaning of a utterance is an exhaustive, although often imperfect, process, at least as far as referential expressions are concerned.

Nevertheless, we believe that there at least two reasons to think that the story is, on this point, more complex than this. In the first place and as a matter of intuitions, a hearer can recognize the propositions expressed in (2)-(3) in quite poor utterance contexts, wherein the background information allows her to only identify the referents of the referring expressions. Hence, it is not entirely exact to say, as Recanati does, that a complete identification of the relations holding in 'John's book' and 'Jones was after [the man]' is needed in order to secure understanding of what is said by uttering (2)-(3). It is perfectly possible, for instance, to understand what is said in (2) in a situation where both the hearer and the speaker do know the referents of 'he', 'John', and have just seen the referent of 'he' carrying one particular book, what prompts the speaker to utter (2) (presumably pointing to the book). In addition, let us suppose that, due to the particular contextual circumstances, the only information that the hearer has about 'John's book' is that neither the book was written by John nor it was sought by John. As far as we can say, this information continues to underdetermine, on the hearer side, the kind of relation holding between John and the book. Indeed, it does necessarily not entail any particular reading, for instance, that the referent of 'he' bought the book from John, the original owner. Nevertheless, it seems quite difficult to contend that this residual underdetermination prevents the hearer from delivering context-dependent truth-conditions of the utterance, relevant enough in the context of utterance. Such contextually relevant truth-conditions will be ***those that do not violate any truth-condition that the speaker could entertain in the context of utterance*** and belong to the proposition expressed. Equally important it is that, as hearer's conditions lack enough contextual enrichment of one of the expressions of speaker's utterance, such conditions will be less specific than, and dependent on, speaker's conditions. However, the hearer's truth-conditions will be consistent with the pressumption that the speaker is observing the Gricean maxims of conversation.

Secondly, there seems to be a gap between using a definite description referentially and the actual way that the speaker is thinking of the referent. As Bach (1987, 1994) argues, if the speaker is using 'the *F*' referentially, presumably "he must be thinking of the referent in some other way that just as the F. He could be thinking of it under some other description, in some non-descriptive way, or, mixing the two, under an indexical description" (Bach 1987, p. 118). If we abbreviate this other way of thinking of the *F* with the singular term ***d***, then ***d*** is a term of unspecified type entertained by the speaker that translates something like 'what I [the speaker] have in mind (about the *F*)'. [33] Thus, it turns out that the speaker believes that ***d*** is the *F* and, as Bach suggests, ordinarily, "it will be mutually believed by speaker and audience that ***d*** is the *F*" (Bach, op. cit. Ibid, note 9). [34]

[33] See Bach (op. cit. p.301).

[34] As Bach remarks, it is also possible that the speaker might believe only that the hearer believes that ***d*** is the F or even that the hearer believes that the speaker believes that ***d*** is the F.

Nevertheless, the important issue here is that the speaker need ***not*** be expressing the belief that ***d*** is the *F* whenever he uses it referentially. Otherwise, the process of inferring the intended meaning would, on the hearer side, become something like a mind-reading process. In Bach's words

> [...T]hat requires intending the hearer to think of the referent as ***d*** and the speaker may have no such intention. In using 'the F' referentially, he is making an objectual reference. His referential intention is to be expressing a belief about the object that he presumably takes to be the F, but it does not specify how the hearer is to think of that object. It is satisfied if the hearer does think of that object in some way or another (perhaps under some other description), taking that object to be the one the speaker is expressing a belief about (Bach, op. cit., p. 118)

This leaves open the possibility that whenever referential uses do not express the belief of the speaker that ***d*** is the *F*, i.e. speaker's intending the hearer to think of the referent as ***d***, the reference recognized by the hearer remains unspecified or nonspecific. In such a case, the thinking of the hearer depends just on what the speaker ***expresses*** and ***intends*** him to think. However, the way in which the speaker is actually thinking of the *F* as ***d*** is not accessible to the hearer. Bach states the point as follows.

> This leaves open the possibility that the hearer is thinking of the object in no other way than as the one the speaker is ***expressing*** a belief about.That is a case of what I call UNSPECIFIED reference, in which the object the hearer the hearer actually thinks of depends on the object the speaker is thinking of and intends him to be thinking of. (Bach op. cit., p. 118, note10)

Bach's suggestion about the presence of unspecified or nonspecific reference in the process of disambiguation of definite descriptions is, in part, a psychological claim. Interesting as it may be, the claim can however be challenged by semanticists. Semanticists could contrast Bach's assertion about nonspecific referents with the necessity of having identity criteria to identify the referents of our expressions. That is, criteria according to which an object can be individuated if and only is they tell us what must be the case for something to be ***the same thing*** as that object.[35] Nevertheless, increasing evidence coming from psychological and cognitive research points out that identity criteria are not always operative in actual cognitive situations. For instance, Dretske has argued that one can refer to an object, or think of an object, without knowing what sort of object it is. Here is part of his argumentation.

> Perceptual beliefs of a certain sort—what philosophers call ***de re*** beliefs (e.g. ***that*** is moving)—are often as silent as gauges about what it is they represent, about what topic it is on which they comment, about their reference. Clyde can see a black horse in the distance, thereby getting the information about a black horse (say, that is near the barn), without getting the information that it is a black horse—without, in other words, seeing ***what*** it is. Just as a gauge represents the gas level in my tank without representing it as the amount of gas in my tank, Clyde can have a belief about (a representation ***of***) my horse without believing that it is (without representing it ***as***) my (or even ***a***) horse. (Dretske, 1988, p.73)[36]

We believe Dretske's example and other similar ones often occur in perception situations and thereby confer psychological reality to the phenomenon of referential nonspecificity. Consequently, the psychological presence of unspecified or nonspecific reference shows, in our opinion, that disambiguation of referring expressions and, in particular, of definite descriptions, is a more complex process than on first thought. For the determination of referential usage of descriptions will, in many cases, not imply an exhaustive specification of the intended referents. Thus, if speakers and hearers to entertain (in successful communication situations) thoughts about such referents and there is indirect psychological evidence supporting such thoughts, a promising line of research dealing with unspecified or nonspecific referents can be envisaged. One crucial contribution to the development of this line of research is to show systematic applications of the notion of unspecified or nonspecific reference both in pragmatics and semantics. We are going

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[35] See Geach (1957)

[36] The mode of presentation involved in Drestke's example is crucial in human cognition according to some psychologists; see Kahneman and Treisman (1994), and Treisman (1992), ***apud*** Recanati, (1993, pp. 170-172).

to face the problem of the applications very directly in this thesis. In order to deal with this problem we should be able to show how incorporation of nonspecific referents takes place in our semantic representations. This will be done for the particular area of pronominal anaphora in chapters five and six.

To sum up, we have seen that the enriched story delineated by Recanati allows us to explain quite plausibly disambiguation of definite description uses. It takes place at the level of what is said and is a consequence of specifying the underdetermined content of the conventional meaning of description utterances. Such a specification is carried out in accordance with Gricean enriched pragmatic-cognitive background. Thus disambiguation is only possible if we accept a distinction, according to the enriched story, between the external proposition (the external truth-conditions) and the proposition expressed. Finally, and more important for our purpose, disambiguation of referential usages at the level of what is said does not imply complete or exhaustive specification of the reference. In some cases at least, there are good philosophical and cognitive reasons to assume something like unspecified or nonspecific referents as a proper notion in pragmatics and semantics. This notion, as we hope to show, has useful applications in different cases of referential nonspecificity.

We have dealt in this section with several arguments about referential nonspecificity, which will be a core notion in our dissertation. Referential nonspecificity is concerned with just referring expressions, i.e. non-sentential expressions, not with the sentences containing them. Indeed nonspecificity of non-sentential expressions has a direct impact on nonspecificity of the sentences containing them, since if the non-sentential expressions are nonspecific, so the sentences containing them will be. Sentential nonspecificity is what is usually termed ***semantic nonspecificity*** by linguists. The goal of the next section will thus be explain in some detail that notion.

2.2 Semantic Nonspecificity: Some Definitions and Properties

First we give the general definition of semantic nonspecificity that we shall use in this dissertation. It is derived from work by Pinkal (1995), which to a certain extent draws from work by Fine (1975) regarding vagueness and degrees of truth. At this stage, it is important to keep in mind that more than offering ***a definition*** of nonspecificity, we shall try to offer an ***idealized*** criterion, based on Pinkal's work, to distinguish nonspecific sentences from ambiguous and vague ones only. This clarification has, at least, the following consequences:

(a) we are not claiming that, by using the criterion, a line can be drawn in single case between nonspecific sentences and non-univocal sentences. Thus, on the one hand, the criterion is not a yes-or-no test but at best a methodological idealization, and, on the other hand, in accordance with Pinkal, we accept that in everyday language we find enough merged cases of ambiguity, vagueness and nonspecificity as to make any such a test inoperative in practice.

(b) We are not either implying that the criterion allows us to establish if a sentence is ***completely*** univocal, that is to say, completely specific. In that case, the criterion should presuppose something like an absolute or essential notion of nonspecificity. Talk about essentialism when examining nonspecificity, ambiguity or other similar semantic properties is, in our opinion, misleading and hopeless. Hence we believe that both nonspecificity and specificity—whatever they do mean—are relative or degree issues and, therefore, we incline to talk about the ***relative specification*** of a (less specific) sentence or predicate, instead of talking about making a sentence or predicate ***absolutely specific***.

(c) finally, because of the application of the criterion, it is possible that other 'normal' (or univocal) sentences could be counted as nonspecific. We believe that this consequence should not affect our whole approach. Indeed, the crucial question of whether the whole everyday language or discourse is, to an important extent, nonspecific or underspecified in nature is out of the reach of this dissertation. A positive answer to that question, though, would make our view about anaphora even more plausible.

Before offering the aforementioned criterion we have to clarify some points regarding Pinkal's theory. Firstly, the focus of the theory is put on the notions of ambiguity and vagueness rather than on nonspecifity. However, it permits us to deal with nonspecificity due to the systematic connection that it establishes among three notions: ***indefiniteness***, ***precisification***, and ***specification***. In general, Pinkal claims that a sentence is semantically indefinite if and only if,

> in certain situations, despite sufficient knowledge of the relevant facts, neither "true" nor "false" can be clearly assigned as its truth value (Pinkal 1995, p.15)

A typical example of that kind of sentence is 'Carlos Gardel was Argentinean', which, formulated as a question, would receive mostly an answer *yes*, sometimes a *no* answer, while some would probably avoid a *yes* or *no* answer. Also, the variety of answers could be traced to a variety of assumptions about events in the world by depending on the interpretation of the verbal phrase 'was Argentinean'. Presumably, for many of those answers, additional data will not clear things up further (for instance, if the dispute is not focused precisely on Gardel's birthplace) in the sense that some will keep their *yes* answer, others their *no* answer and finally some, while accepting that both kinds of answers are equally good, will keep dubious. As a result, one feels inclined to say that ***in general*** the sentence has no definite truth value. Pinkal adds that everyone will agree that such a sentence ***may*** receive a definite truth value in a precise context (for instance, if the dispute is precisely about Gardel's birthplace). Thus, this licences the following Precisification Principle:

(***Precisification Principle***) A sentence is of ***indefinite*** truth value in a situation or ***context C*** if and only if it can be ***precisified*** alternatively to "true" or to "false" in such a context

In other words, a linguistic expression is semantically indefinite if it has something like a 'potential' for being made ***precise*** with respect to a truth value in distinct contexts or situations. Furthemore, in accordance with compositionality, an expression (for example, a predicate) will be semantically indefinite "if it is responsible for the semantic indefiniteness of sentences in which it occurs as a subexpression" (Pinkal op.cit., p.40).

So, the sentence 'The Santa Maria is a fast ship' containing the degree adjective *fast* can be rendered precise either with respect to a context in which *fast* is interpreted as *fast for a modern ship*, in which case the sentence is false; or with respect to a situation in which *fast* is interpreted as *fast for a ship of her age*, in which case the sentence can be true or false, depending of the kind of comparison.[37] In summary, indefinite sentences have a 'potential for precisification' to either ***truth value***. Also, in the case of words, for example, predicates, such a potential will apply to ***domains of inviduals***. In particular, according to Pinkal, since the denotations of the sentences containing predications are truth values, the meaning of predicates reduces to "a function from contexts to functions from objects to truth values" (Pinkal 1995, p. 41). Context-specific functions from objects to truth values subdivide the domain of individuals into two subsets, the positive and negative domain, if the predicates are precise. However, when predicates are the source of indefiniteness, they induce a partitioning into three subsets, namely, the ***positive***, ***negative***, and ***indefinite*** domains. Thus, they are alternatively precisified when we find out, so to speak, that the denotations associated with their indefinite domains belong to the positive or negative domain of another (thereby more precise) predicate.[38]

Now, ambiguity and vagueness are closely related phenomena, precisely because "both allow unproblematically precisifications" (Pinkal, op.cit., p.72), and thereby both are indefinite. However, these phenomena can be differentiated—although not once and for all—if an additional criterion is introduced. Pinkal offers the following rationale for his criterion:

> There is apparently no quantitative criterion that can clearly

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[37] The example is from Poesio (1996)

[38] The technical definition given by Pinkal is as follows:

> Let *d*1 and *d*2 be possible denotations of predicate expressions: *d*1 is more precise than *d*2 if and only if (i) the positive (or negative) domain of *d*1 includes the positive (or negative) domain *d*2, and (ii) at least one object from the indefinite domain of *d*2 belongs to the positive or negative domain of *d*1 (Pinkal op.cit., p.55)

> distinguish the effects of vagueness and ambiguity from each other. We may speak of ambiguity when we can detect any contours in the indefinite domain at all; when certain precisifications stand out in the continuum as standard precisifications [...] conventionalized as "readings". We may speak of ambiguity in such cases, but we do not have to: whether an expression is ambiguous or only vague is a question that cannot be cleared up once and for all. Indefiniteness is perceived as ambiguity when alternative precisifications are predominant, as vagueness when an unstructured continuum presents itself. (Pinkal 1995, pp. 75-6)

Thus, the criterion below, based on the continuity vs. discreteness contrast, should be applied taking into account the essential relativity to the context of communication.

Amb-Vag : If the precisification spectrum of an expression is perceived as discrete, we may call it ambiguous; if it is perceived as continuous, we may call it vague.

By contrast, ***nonspecific*** sentences and expressions need not any precisification, according to the definition above. In particular, nonspecific predicates are always (relatively) ***specified***—not precisified—from a positive domain to another positive one, which shows that they cannot give rise to indefiniteness.[39] Pinkal makes the point clear enough as follows:

> The notion of precisification must not be confused with that of <u>specification</u>. The precisification relation betwen predicates is based on the indefinite domain. But it is the positive domain that is crucial to the relation of specification (Pinkal, op. cit., p. 57).

Pinkal introduces then the specification relation between predicates by means of the following principle.

[39] See Poesio (1996, pp. 159-201); the distinction between indefiniteness—in the sense of vagueness—and generality or nonspecificity can be traced back to Black (1937). In addition, the first treatment of ambiguity and vagueness in terms of precisifications was proposed early on in Fine (1975). Finally, for a penetrating philosophical examination of vagueness and cognate matters see Williamson (1994).

[(**Sp Pred**)] A predicate F (in context c) is <u>more specific than</u> a predicate G if and only if the positive domain of F (in c) is included in the positive domain of G (in c).

Finally, he makes the following warning about the recurrent confusion about precisification and specification.

> The complex predicate ***fast for a sailing ship*** is in many contexts more precise than ***fast***, However, ***sailing ship*** is not more precise than ***ship*** or ***vessel*** [....] The sense of an expression appears to be more precise whenever the context in which is uttered is more specific. This parallelism may be responsible for the fact that "precisification" and "specification" are often not distinguished. But the main reason for the confusion of these two concepts in semantic literature (and of the corresponding pairs of concepts "precise"/"specific" and "vague"/"general") probably lies in the fact that generality [or nonspecificity] and indefiniteness can lead to the same pragmatic defect of utterances: to a lack of informativeness (Pinkal, op. cit., pp. 57-8)[40]

We can now show the result of assuming Pinkal's indications above by using concrete examples. The standard example of nonspecificity "My sister is the Ruritarian secretary of state" (see Zwicky and Sadock 1975), if true, will be true only if ***no*** potential specification in a given context of the (indexical) term *my sister* (for instance, age, academic career, political background etc.) changes its truth, i.e. if it does not render the sentence in question false. Concerning nonspecific predicates we have a similar situation. For instance, a sentence like "John is between 1.60m and 1.70m in height", if true, will be true only if ***no*** potential specification of the predicate *is between 1.60m and 1.70m in height* (for instance, *is 1.65m. in height*) changes its truth, i.e. if it does not render the sentence in question false. Intermediate possibilities can be imagined as well. With respect to falsity, the inverse variety can be found: the sentence "Wilfredo is between 1.90 and 2.00m. in height," if false, will be false only if none specification in the range

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[40] Pinkal points out that, in fact, there appears to be a certain tradition concerning such a confusion coming from Russell(1923) in philosophy, and Lakoff (1970) and Kempson (1977) in linguistics.

between 1.90 and 2.00m. changes its falsity, i.e. if it does not render the sentence in question true. As a result of the examples above, it seems clear that, in accordance with compositionality, specification of a nonspecific expression will allow us to complete the specification of the sentences containing it, but the latter specification will not imply any effect on their truth-value.

In addition, Pinkal's theory suggests how we can account for the differences and relations among ambiguity, vagueness and nonspecificity in terms of the range of readings and the borders of the application domain associated with each of them. On the one hand, ambiguous sentences (or their lexical items) can hardly determine a 'common' range of readings that entitles us to decide whether the sentence in question is true or false. Usually the readings generated by ambiguous sentences are semantically (and logically) unrelated. On the other hand, we know that additional precisifications of a vague sentence will generate alternative truth-value assignments for the same sentence. However, unlike ambiguous sentences, vague sentences (as well as nonspecific ones) denote a common range of readings. This entails, according to Pinkal, that the range of precisification of vague sentences possesses internal continuity.[41] As expected, the difference between nonspecific and vague sentences comes into focus when both are compared with respect to the sharpness of borders of their domain of application. Vague predicates, and hence vague sentences, do not seem to have clear limits at all, but rather a fuzzy zone between the positive and the negative domain of application—consider simply the predicate *is of average height*.[42] Nonspecific predicates, on the contrary, denote in most cases domains with sharp boundaries—consider the predicate *is between 1.60m. and 1.70m. in height*—and, consequently, sharper ranges of readings.[43] Finally, as

[41] Anyhow, it is not entirely clear whether internal continuity is a ***necessary*** condition of vagueness; see Pinkal (1995, p. 75).

[42] See Sainsbury (1991) for a discussion of vagueness and boundaries.

[43] See Pinkal (1995, pp. 57, 74); these distinctions are also implicit in Williamson (1994). Kooij (1971, pp. 117-21) contains a more linguistic discusssion of the distinction between ambiguity, vagueness, and nonspecificity. It is worth noting here that Kooij in his early work already refuses to represent the meaning of a nonspecific word by means of a disjunction of senses of the form 'S1 v S2 v ... v Sk'. He states two reasons for that refusal. First, the disjunctive view of nonspecificity reduces nonspecificity to some sort of

suggested by Pinkal, lack of boundaries may lead us to assume that vague sentences support many (perhaps an infinite number of) precisifications in the range of readings.[44] By contrast, nonspecific sentences seem to support only a few of them.

In conclusion, we can formulate the following **criterion of nonspecificity** for sentences. A nonspecific sentence S is a sentence that satisfies the following conditions:
(i) when S is uttered in a context C, it is ***definitely*** true or false for the interpreters in C within a range R of situations $s_1, \ldots, s_k$; (ii) given any potential specification in R, S preserves the original truth-value (true or false) assigned to it (and therefore is made ***specifically*** true or false of one of the situations **s** in R);[45] (iii) there is no serious problem for interpreters to determine the (conventional) boundaries of R in the spectrum.

Thus, condition (i) allows us to distinguish nonspecificity from mere vagueness because vague sentences—such as 'W. Quine is bald' or 'That is not a heap'—in (normal) utterance circumstances are not definitely true or false and because such a lack of definiteness is always due to the difficulty of drawing clear boundaries for the range of situations or readings. Condition (ii) allows us to distinguish nonspecificity from ambiguity because (structurally) ambiguous sentences, such as 'the shooting of the hunters was terrible', may

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ambiguity, i.e. to a sequence of discrete and unrelated senses. Second, such a view turns ***hyponymy*** or superordination of meanings into a redundant relation because superordinate or generic words (such as *coloured* or *animal*) must be defined, not in terms of their ***sense relations*** with the subordinate words, but rather in terms of the subordinate words themselves, which leads to descriptive absurdities. Together with these reasons can be added that the disjunctive view offers no help in dealing with ambiguity, as indicated by Poesio (1996), van Deemter (1996) and Atlas (1988), among others. Finally, it should be noticed that traditional views (inspired by Mill's distinction between denotation and connotation of a term) that take nonspecificity to be ***generic*** in nature, i.e. as realizing the idea of a 'genus-species' relationship tend to endorse the disjunctive view. The reason is that in such a case the meaning of the nonspecific word (the genus) is given by its connotation (its species), thus generating disjunctive meanings out of the latter. Hence generic views of nonspecificity are directly subject to the previous criticisms.

[44] For discussion on this criterion see Pinkal (1995, p.75).

[45] The criterion of nonspecificity above is a sentential, not lexical, one. Nevertheless, there is an obvious way to connect the two criteria: a lexical nonspecific item (a nonspecific term or predicate) is one which is satisfied for a certain precise range of objects—the positive domain or the extension of the term—, and such that any additional specification of it (for instance, applying it to a certain subset of objects in the range) preserves the original satisfaction.

change their original truth-value given a certain specification (or precisification) in a certain context (see QT in section 4.2). Also, conditions (i)-(iii) assume that speakers or interpreters obey in general cooperative conversational maxims when uttering nonspecific sentences. Therefore, the application of the **Amb-Vag** criterion in typical cases of nonspecificity will be completely irrelevant.

Now in order to apply the conditions above we examine some typical examples of nonspecific sentences.

(4) An ape escaped from the Zoo.
(5) Being a parent can be hard work.
(6) Mary went to the University.
(7) Mary is between 1.70 m. and 1.80m. in height.
(8) The King will attend. (Bach 1987)
(9) I love you too. (Bach 1982)
(10) [The philosophy lecturers in my college]$_1$ consider that *they*$_1$ are underpaid.

Sentence (4), if true in a given context, will remain true under any potential specification of the term *ape*—orangu-tan, gorilla, chimpanzee, etc. Sentence (5), if true in a given context, will remain true under any potential specification of *parent*—for instance, male parents, female parents, British parents, tall parents, etc. [46] The same applies to sentences (6)-(8). Sentence (9) is interesting because its nonspecificity is not just the result of the indexicality of the personal pronouns and linguistic information provided by the adverbial particle *too*. The intended meaning of (9) is systematically context-dependent and, in particular, depends on mutual knowledge shared by speaker and hearer about the utterance circumstances of the sentence 'I love you'. The result is a wide range of readings

[46] It is worth emphasising that although the criterion above does allow errors of specification in the range of readings on interpreters' part, such errors will not affect the property of preserving the original truth value of nonspecific sentences. If, for example, an interpreter wrongly specifies *an ape* by means of *an orangu-tan* instead of *a gorilla*, the first specification makes equally true sentence (4). Errors of specification are context-dependency issues and therefore they are not related to the semantical constraints on nonspecific sentences.

and thus of potential specifications.[47] Sentence (10) shows that anaphoric pronouns can be subject to the same nonspecificity affecting personal pronouns. Since the interpretation, in that sentence, of the plural description 'the philosophy lecturers in my college' depends on the specification of *my college,* the anaphoric pronoun *they* will inherit the nonspecificity of its antecedent. Finally, the explanations above clarify a characteristic clearly associated with nonspecific sentences: their context-sensitivity. That sensitivity seems to always be located in some constituent of the sentence that operates as a parameter of specification, for instance, in the case of some of the sentences (4)-(10) above, the noun phrases (*my sister*), pronouns (*they*), adverbs (*too*) or parametric predicates (*is over fifty*, or *is between 1m. and 6m.*). It is interaction between the contextual information associated with these parameters and another (linguistic or extralinguistic) information that provides the relevant specifications of such sentences. In (9), it is the contextual information associated with the utterance of *too* that determines the range of specifications. For example, if we know that the utterance of that adverb has not been prompted by the previous utterance of 'I love you', then we have to discard direct reciprocity. In other words, we have to discard that reading which says that just as the hearer loves the speaker, so the latter loves the former. This decision not only sharpens the borders of the range of readings but also clarifies the role played by the adverb in the semantic structure associated with the sentence (9).

We can now examine a particular kind of nonspecific sentence bearing closely on the issues to be discussed in the following chapters. These sentences contain plurals, i.e. they are sentences containing plural NPs in both subject and object positions. Sentences of this sort are (11)–(12) below, where the speakers exploit different contexts to say things about more than one individual, namely, about a set, group or collection of individuals.

(11) Two men sang two songs.

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[47] There are at least three remaining readings of (4): (a) that the speaker loves the hearer and someone else too; (b) that like someone else, the speaker too loves the hearer, or (c) that the speaker has love as well as some other feeling for the hearer. See Bach (1982, p.593) for a discussion about the nonspecificity of this kind of sentences.

(12) The philosophers travelled to Stuttgart.

Before explaining these and other cases it is necessary to indicate that the general claim about the nonspecificity of plural sentences, and the plural NPs in them, has not passed unchallenged. As one might expect, the objections have come from theorists endorsing an ***ambiguity*** view of sentences like (11) and (12).[48] Despite the controversy created by these objections, we think that the prospects for an ambiguity theory of ***all*** plural sentences and, thereby, of all plural NPs in them, are not compelling. Given that a detailed discussion of plural sentences would fall beyond the scope of the present investigation, the previous conclusion relies on the arguments and results that the nonspecificity vs. ambiguity controversy about plurals has provoked in recent literature.[49] Consequently, in our opinion, an analysis of most plural sentences in terms of nonspecificity, based on the methodological groundwork delineated in this section, continues to be preferable. This methodological framework dictates that sentences such as (11) and (12), if true in a context C, remain true under any potential specification of their range of readings in C. On the other hand, (11) and (12), if false in a situation or context C, do not become true under any specification of their range of readings in C. This conclusion requires further substantiation. It must be shown in particular how plural sentences generally match the main features of nonspecificity isolated in the beginning of this section, namely, contextual parameterization, continuity, and sharpness of the range of readings.

Sentences containing plural NPs are usually open to two well-known interpretations: ***distributive*** interpretations, in which the VP of the sentence says something about each of the entities taken in by the NP (in subject or object position) with which the VP combines, and ***collective*** interpretations, in which the VP of the sentence says something

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[48] Gillon (1984,1987) formulate the most well-known theory of ambiguity of plurals. Also see Schein (1993).

[49] The criticism of Gillon's semantics was initiated by Lasersohn (1989). Gillon replied in Gillon (1990). The criticism was continued by van der Does (1992, 1993a), Verkuyl (1993), Lasersohn (1995) and Verkuyl and van der Does (1996). See also for further discussion Lonning (1991) and Schwarzschild (1991).

about the entities as a whole (a group or collection) taken in by the NP with which the VP combines. For example, the preferred interpretation of sentences (13)–(14) below is the distributive interpretation whereas the preferred interpretation of sentences (15)–(16) is the collective interpretation.

(13) Every boy ate two burgers.
(14) Some musicians played a solo.
(15) Four musicians played a quartet.
(16) John and Ivonne are a happy couple.

Nevertheless, plural sentences often give rise to non-univocality with respect to one reading or another. For example, consider (17)–(19) below.

(17) Two men lifted one table.
(18) The two senators travelled to the convention.
(19) John and Ivonne earned exactly £2000 this month.

Sentence (17) can be interpreted collectively as saying that the two men as a group lifted the table, or distributively as saying that each man lifted one table. On the distributive reading, sentence (18) implies that the senators have travelled separately to the convention, whereas on the collective reading, it implies that the senators have travelled together. On the distributive reading, sentence (19) implies that John and Ivonne earned £2000 each; read collectively it implies that they earned as a group £2000. In these cases the range of readings is restricted to either complete distributivity (which can be expressed by the adverb *separately*) or complete collectivity (which can be expressed by the adverb *together*). This might suggest simple ambiguity of the sentences. Nevertheless, one striking aspect of plural sentences is the number of intermediate possibilities of interpretation that they offer (whatever the internal factor involved).[50] Thus, these

[50] There are at least three possible internal sources which may explain the emergence of the whole range of plural readings: the NPs (whether in subject or object position), the VPs, or quantifier scope. The first source has been explored and defended, among others, by Lakoff (1972), Kroch (1974) and Gillon (1987, 1990, 1992). The second source has been explored and defended, among others, by Hoeksema (1983), Scha (1981), Link (1983, 1987), Lonning (1987), Landman (1989), Lasersohn (1988, 1989) and Schwarzschild (1991, 1992). The third possible source has been defended by Mc Cawley (1968), Kroch (1974) and Higginbotham and Schein (1989). A fourth possibility, which sees the construal of readings as the consequence of

possibilities extend the range of readings between completely distributive and completely collective readings. Consider, for example, the following sentences:

(20) Three men lifted three tables.
(21) The three senators travelled to three conventions.
(22) John and Ivonne ate three large pizzas.
(23) The musicians wrote three operas.

Some semanticists take it that (20) may generate at least four readings.[51] Besides the standard collective (the group of three men lifted a total of three tables) and the standard distributive reading (each man lifted three, perhaps different, tables), it also allows a ***semidistributive*** (the three tables were each lifted by perhaps different groups of three men)[52] and a ***cumulative*** reading (three men each lifted the same set of three tables).[53] Sentences (21) and (22) are amenable to the same analysis, with the semidistributive reading presumably corresponding to the marked or non-preferred case. Sentence (23) cannot clearly exclude any reading. Finally, since each reading can be associated with a different set of truth-conditions, semanticists usually formulate structures (whether in terms of logical scope mechanisms, set-theory, lattice-theory or other formal languages) to formally capture those conditions.[54]

It is worth, at this stage, asking the question of whether the aforementioned readings, or a greater (though fixed) number of them, exhaust the meaning of plural sentences like (20)-(23). Some theorists have given a positive answer to that question whereas others remain sceptical. We have two good reasons to agree with the second theorists. The first reason has to do with the assumption, taken for granted by the first theorists, that the

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interpreting the combination of NPs and VPs, has been suggested by Roberts (1987).

[51] Scha (1981), Link (1983), Lonning (1987), van der Does (1992, 1993a), Verkuyl and van der Does (1996), Kempson and Cormack (1981a).

[52] Schein (1993)

[53] Cumulative readings were firstly noted and distinguished in Scha (1981).

[54] Gillon's semantics of plurals is a case in point. He suggests dealing with the multiple readings of plural sentences by introducing a new set-theoretical apparatus in terms of "minimal covers".

potential readings of plural sentences can be specified by means of logical devices that are not sensitive to information other than the one coming from the literal or grammatical meaning of the sentences. Usually, this information is encapsulated in (implicit or explicit) parameters of different type, according to the nature of the sentence. In the case at issue the parameters should incorporate non-grammatical information affecting the processing of the pluralities. The second reason to disagree with those theorists that accept (logical) exhaustiveness of readings is that they seem to have a misleading or limited idea about what specification means, even those that expressly support an analysis of plural sentences in terms of nonspecificity. All these theorists, it seems to us, think about specification in absolute terms. Therefore, they think that deployment of all (logically possible) readings of plural sentences is all we need to represent the complete meaning of the latter. We believe that this conclusion is hopeless.

To appreciate the cogency of the above reasons, let us formulate a possible logical form of the collective reading of sentence (20) inspired by a nonspecificity analysis of plural sentences given by Kempson and Cormack (1981a). To logically represent the reading in question we will introduce restricted quantifiers ranging over sets. We will henceforth call that notation ***restricted set*** notation. This notation involves restricted quantifiers with set variables in their restriction.[55] Set variables in the restriction can therefore stand for arguments of predicates (or properties), for example, the predicates *is three*, *is large* or *is more than half of*. Restricted quantifiers will correspond to second-order formulae. By contrast, the scope of those quantifiers will correspond to (unrestricted) first-order set-theoretic formulae determining scope interactions as usual. Thus, Kempson and Cormack contentiously postulate, by appealing to some arguments that we are going to examine in chapter five, that (24) below is the most non-specific (the 'weakest') logical form of (20) ('X' corresponds to the set of men, 'S' to the set of tables and 'L' to the predicate *lift*; for more detail see chapter five, section 5.1).

(24) $[[\exists X: |X| \geq 3]\ [\exists S: |S| \geq 3]\ [(\exists x)x \in X]\ [(\exists s)s \in S]]\ (Lxs)$

[55] Restricted sets are used, with differences in the notation, by McCawley(1993) and Schein (1993).

The informal paraphrase of (24) will read as: there are at least three men for at least one of whom it is true that he lifted a table and there are at least three tables for at least one of which it is true that a man lifted it.[56] Intuitively, it can be recognised that (24) is completely nonspecific concerning the normal or literal meaning associated with (20) (for detailed discussion see chapter five). That is to say, the truth-conditions represented by (24) cannot reflect the conventional meaning or, by using the terminology of the previous section, the ***external*** truth-conditions associated with (20). In other words, hardly any hearer after utterance of (20) will infer that the intended meaning of the speaker is represented by the truth-conditions of (20). Controversial as (24) may be as a nonspecific reading ***of*** (20), Kempson and Cormack argue that they are able, by means of certain procedures, to derive a version of the collective reading of (20) (that Kempson and Cormack call ***incomplete group interpretation***; see section 5.1). The structure so obtained from (24) is as follows:

(25) $[\exists X: |X| \geq 3]\ [\exists S: |S| \geq 3]([(\forall x)x \in X]\ ([(\exists s)s \in S](Lxs))\ \&\ [(\forall s)s \in S]$
$([(\exists x)x \in X](Lxs)))$

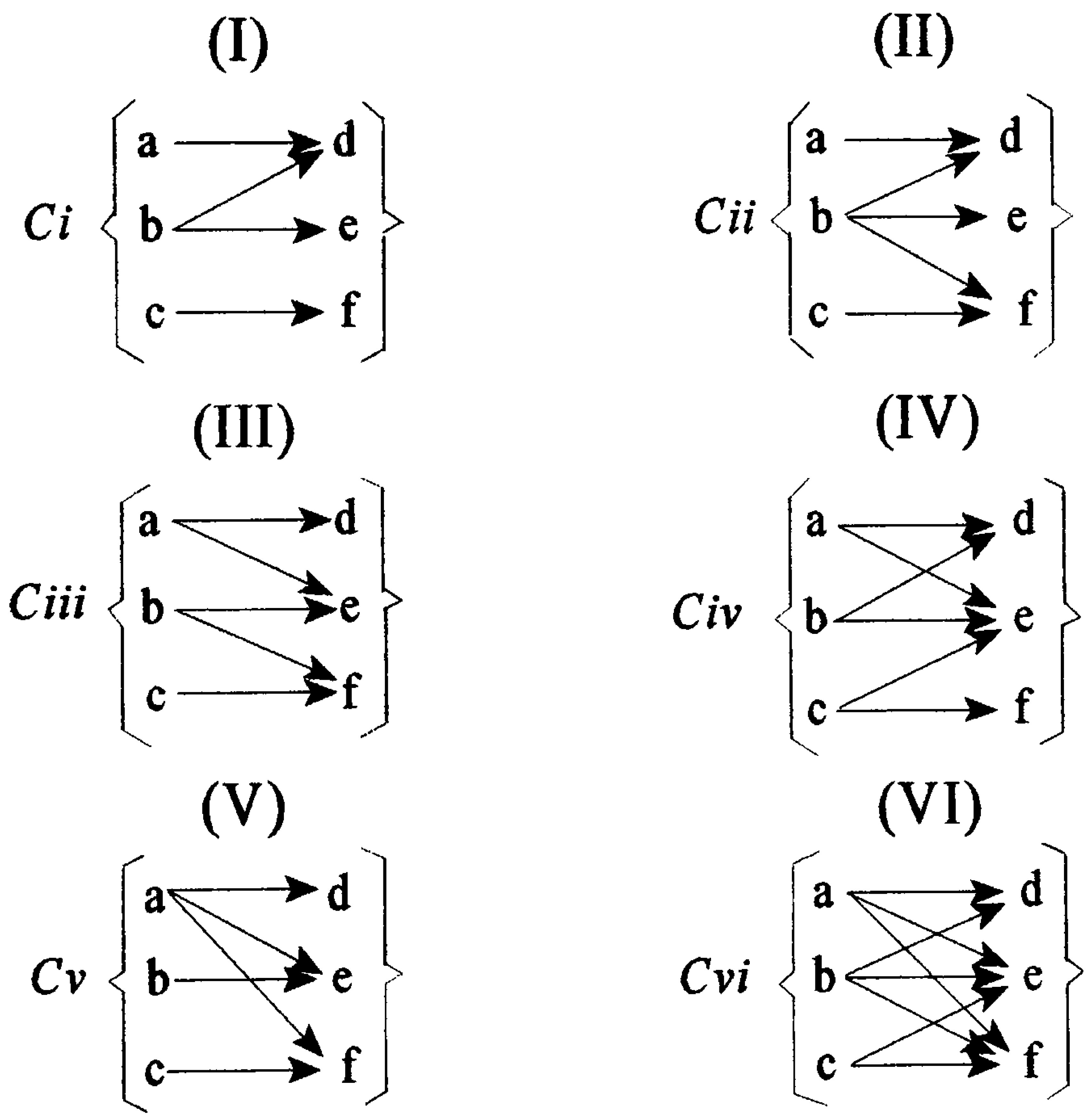
According to Kempson and Cormack, (25) should read as: there is a set of three men and a set of three tables such that for all members of the set of men there is a member of the set of tables that they lifted and for all members of the set of tables there is a member of the set of men that lifted them.[57] Thus structure (25), for Kempson and Cormack, expresses the collective reading—in the sense of an incomplete group reading—of (20), i.e. the interpretation according to which a group of three men lifted a total of three tables. According to the view set up in the previous section, what we can say is that the

[56] See Kempson and Cormack (1981a, p.270).

[57] The first-order existential quantifiers may not be paraphrased by using "at least" here. Kempson and Cormack justify this restriction by explaining that "[t]his can be deduced from the logical forms; 'at least' is available as an entailment for some proposition '*Pn*' with numerical quantifier '*n*' just if '*Pn*+1' entails '*Pn*'. The condition does not hold for [(25)]", Kempson and Cormack (1981a, pp. 303-4).

structure (25) represents ***one*** of the external propositions determined by the conventional or literal meaning of the sentence (20). The other external propositions would correspond, if consensus here is possible, to the readings pointed out above. Nevertheless, it is easy to envisage situations that show that the external proposition determined by (25) cannot be considered an exhaustive representation of the (relative) specifications of the meaning of (20) under the collective—or incomplete group—reading. For example, we can provide for (25) a situation that supposes a set *A* of men—*A*={a,b,c}—and a set *B* of tables—*B*={d,f,g}—connected by means of the *lift*-relation. This situation then allows us to specify at least the following six situations ('*C*' stand for 'context'):

(26)



It is, we think, clear enough that (I)-(VI) are all (relative) specifications of (25). Therefore, this shows that the externality of the truth-conditions represented in (25) capture only part of the collective reading of (20). Thus, (I)-(VI) belong to the level of what is said, i.e., they represent possible propositions expressed by (20), under its collective meaning—represented by (25). The same, under different specifications, is true of some of the other readings (the distributive reading will generate in the proposed situation at least 8 specifications).

The foregoing shows that plural sentences can be strongly underspecified by their grammatical or conventional meaning. That is to say, it reinforces the claim supporting their nonspecificity. What is even more important is that our examples reinforce the acceptability of the distinction between the external proposition (determined by the literal meaning) and the proposition expressed, in processing non-univocal (utterances of) sentences. Furthermore, plural sentences can be seen as incorporating clear parametric factors, provided by both the structure of the sentence (linguistic constraints and lexicon) and contextual information. In the case of a sentence like (20), the parametric factor deriving from (I)-(VI) is something like what Barwise and Perry (1983) call a 'plural resource situation' associated with a set A. This resource situation says whether or not A may be interpreted as collection or group. That information can, for instance, be represented by means of '$+Coll(A)$' or '$-Coll(A)$' (implying in the latter case presumably distributivity of the elements of A). Plurality parameters will then help us to get relative specifications of plural sentences. By contrast, representation of (an utterance of) a plural sentence without using those parameters, such as it happens in (25) above, will qualify just as the external reading that we can associate with the sentence. Thus, the semantics of plural sentences raises on its own a central issue, which is whether or not and how we are to incorporate parametric information in nonspecific representations of sentences like (20), so that the rest of the external meanings can be generated (at the moment there are several competing proposals).[58]

Finally, as for the external reading of a non-univocal sentence, it express the different sets of truth-conditions of the sentence that rely only on the literal meaning. As LFs, **lfs** or DRSs determine such truth-conditions, they define the external readings (or external propositions) of sentences. Therefore, according to our explanations in the previous section, LFs and the rest will not tell us which of those conditions are context-dependent. Parameters (in the case of plural sentences) or contextual coordinates (in the case of sentences containing indexicals) will do this job. Therefore, determination of the (relative) specifications of a non-univocal sentence involving crucially some plurality element, will give rise to a ***parameterized*** representation of the sentence. This is the case, we shall argue so in chapters five and six, of some sentences containing pronouns unbound by their antecedents.

[58] It can be said that, simplifying so much, the discussion about the nonspecificity or underspecification of plural sentences has to do with whether there is a primitive reading that will generate the rest of the readings, i.e., the collective, distributive, cumulative, or semidistributive reading. The alternatives, roughly speaking again, are either taking as primitive a nonspecific or underspecified reading which is not included in the set of readings normally associated with the plural sentences or taking as primitive one of the readings in that set. Later, in section 5.1, we shall discuss some early attempts to implement the first alternative. Most recent discussions endorse the second alternative and include, among others, Verkuyl and van der Does (1991) and Lasersohn (1995). For a general and updated discussion see Landman (1996).

CHAPTER III

UNBOUND ANAPHORA AND D-TYPE THEORY

The general aim of this chapter is to explore a particular theory of non-deictic anaphora in the framework of the LF view presented in chapter one. The theory in question sticks to the 'descriptive' view of anaphora and has been defended by S. Neale. One important advantage of Neale's theory is its applicability to a difficult problem confronting any anaphora theory: the so-called donkey anaphora problem. However, as the current literature on the topic makes it clear, Neale's theory has some important limitations. These limitations suggest a dilemma: either we profoundly modify the foundations of the theory or simply abandon it. The specific goal of this chapter is to show that such a dilemma is just apparent. Thus, we argue that there is no justification for abandoning Neale's theory, and, in the course of doing so, we show that the essential features of Neale's theory can remain unchanged. The important change, we propose, is rather methodological and concerns the nature of the phenomenon under study. That is to say, it concerns whether donkey anaphora is a truth-theoretically *univocal* phenomenon. We conclude that, if it is not, a modified version of Neale's theory can be adequately formulated and defended.

In section 1, we introduce the common framework that LF theories share and the problems generated by unbound anaphora (the type of anaphora which donkey anaphora belongs to) within that framework. In section 2, we argue that the so-called E- or D-type solution given by Neale to those problems is effectively more successful than other LF proposals. In section 3, we discuss a characteristic aspect of Neale's D-type theory, its hypothesis of neutrality of semantic number of donkey pronouns. Section 4 discusses several criticisms that Neale's theory has generated in recent literature. In section 5, we evaluate the consequences of those criticisms on Neale's D-type proposal and discuss the apparent alternatives left open. From these alternatives, it follows that neither treatments based on quantification over events, nor treatments retaining uniqueness implications or insisting with bound donkey pronouns, are needed in an eventual modification of Neale's theory. Finally, what is needed, we claim, is a shift of focus. That shift is a consequence of abandoning Neale's commitments both to Geach's truth-conditional approach and to a strict Russellian treatment of donkey pronouns.

3.1 The LF Treatment of Unbound Anaphora

The anaphoric processes to be examined in this chapter suppose explicit *referential dependency* or *coreference* between expressions of a given sentence (or of a set of sentences). This means that we are not going to consider sentences which contain demonstratives or deictic terms as in (1) and (2).

(1) *He* is a good teacher.
(2) Tell *him* I do not want to work.

(3)-(7) below reflect rather the type of anaphoric sentence that we will be focused on in this dissertation (italics are used for indicating coreference).

(3) *Jim* commented on a paper *he* wrote.
(4) *Leyla* commented on every paper *she* wrote.
(5) *Every woman* buys a book *she* disapproves of.
(6) *Some women* buy a book *they* disapprove of.
(7) *The president* does not love *his* wife.

Second, it is a common place in linguistics to represent referential dependencies by ***co-***

indexing the anaphoric expressions and their antecedents. In this way pronouns and their antecedents in (3)-(7) are better represented in (3')-(7') below.

(3') [Jim]$_1$ commented on a paper *he*$_1$ wrote.
(4') [Leyla]$_3$ commented on every paper *she*$_3$ wrote.
(5') [Every woman]$_1$ buys a book *she*$_1$ disapproves of.
(6') [Some women]$_2$ buy a book *they*$_2$ disapprove of.
(7') [The president]$_2$ does not love *his*$_2$ wife.

There are some technical worries surrounding co-indexing in linguistics[1], but they can be ignored without affecting our examination. That is to say, we assume that co-indexing is a useful device that can be used in most linguistic structures describing anaphoric processes.

Given our discussion in chapter one, it is easy to understand now why there is widespread agreement among linguists and philosophers of language that analysis of sentences like (3)-(7) "provided a major impetus for exploration of how classical logic theories might shed light on natural language semantics" (Chierchia and McConnell-Ginet 1990, p. 30). Both semantical approaches to language—dealing with referentiality, quantification, and meaning—and theories more germane to linguistics and syntax—dealing with syntactic representation, binding, types of quantifiers, and levels of representation—have been all subject to intensive scrutiny because of work on the sort of anaphora instantiated by sentences (3)-(7). Generally speaking, anaphoric sentences like (3)-(7) pose a double challenge. On the one hand, they pose a particular challenge to theories that see the meaning of sentences as expressed by truth-conditions. Since such theories, as we saw, try to generate recursive accounts of meaning for a language, the inability to explain the anaphoric phenomena in (3)-(7) would eventually put in question the recursiveness and

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[1] Even though the introduction of co-indexing seems to suggest its interdefinibility with anaphoricity, this is not the case at least for three reasons. (a)'being co-indexed with' is a symmetric relation whereas 'being anaphoric on' is an asymmetric relation. (b) 'being co-indexed with' is a syntactic relation whereas 'being anaphoric on' is a semantical one. Thus, from (a) and (b), we can derive the following statement of the relation between coindexing and anaphoricity: if α is anaphorically dependent on β then α is co-indexed with β. (c), in a strictly representational semantic theory, e.g. in Kamp's DRT, coindexing is not acceptable in all contexts—for instance, in temporal anaphora; see Kamp (199?, pp. 21-2).

formality of the entire truth-conditional project. On the other hand, sentences like (3)-(7) pose a challenge to syntactic theories. In particular, if syntactic theories do not offer a principled way of subsuming the anaphoric relations present in the sentences, the adequacy of the generalizations supporting those theories can be philosophically disputed. As is obvious, this limitation may become particularly serious for UG theories. Neale clearly formulates the two challenges above as follows.

> [A]ny adequate grammatical theory must provide an account of when a pronoun can be understood as anaphoric on some other NP (a name, a demonstrative, a restricted quantifier, another pronoun or even an empty NP ...). In addition, for every sentence S containing a pronoun P that is understood as anaphoric on some other NP, an adequate semantical theory must provide an account of the contribution that P makes to the truth conditions of S. (Neale 1993, p. 803)

To further clarify the significance of these challenges we need to introduce the following standard definition of 'is anaphoric on'.

(8) An expression α is anaphoric on an expression β if and only if (i) the semantical value of α is determined, at least in part, by the semantical value of β, and (ii) α is not a constituent of β (therefore, β functions like the grammatical *antecedent* of α).

The challenge of explaining anaphoric relations, on the semantic side, can be restated now by means of the following question: given a well-formed syntactic structure S' of a sentence containing an expression β, anaphoric on another expression α, how are we to determine the semantic value of β? For expressions anaphoric on proper names, the answer is unproblematic: the semantic value of the pronoun is determined by the value of its antecedent. Therefore, as a consequence of (8) and the Tarskian principle that the referent R of a proper name is the bearer of the name 'R', the definition (9) below becomes part of a referential anaphora theory.

(9) The semantic value of a pronoun $[\ P_i\ ]$ that is anaphoric on a referring expression

$[\![R_i]\!]$ is the semantic value of $[\![R_i]\!]$, i.e. *Ref*($[\![P_i]\!]$, **s**) = R_i [2]

So, if we apply the intuitive constraints (8)–(9) and the QR rule (see chapter one, section 1.2) to a sentence such as (3), we generate the structure (10) at LF level.

(10) $[_{NP}$ a_2 paper he_1 wrote $]_2$ $[_S$ Jim_1 commented on e_2]

That the result in (10) is compatible with other structures constrained by Tarskian principles is clearly seen by the fact that (10) is isomorphic to the restricted quantifier logical form (RQ **lf**) (11) below, which represents the correct truth-conditions for sentence (3) .

(11) [an x: paper x & Jim wrote x](Jim commented on x).[3]

The previous analysis, applicable to pronouns anaphoric on referring expressions, however, will not work for anaphoric sentences whose pronouns have noun phrases as their antecedents, for example, sentences (5)–(7) above. The basic reason for that is that an explanation of the content of such pronouns in terms of the truth-theoretic axioms that apply to their antecedents will fail. It is impossible, for example, to explain the truth-conditions of (5) above in terms of the truth-conditions of the sentence 'every woman buys a book every woman disapproves of'. From a semantic point of view, the natural option would be to look more carefully at the internal quantification mechanisms of sentences (5)–(7). In particular, we should ask, in accordance with definition (8), how do (restricted) quantifiers determine semantic values in first order logic? The answer is that they bind variables under their scope. Therefore, it may be suggested that pronouns occupying the same positions as variables at surface level can be treated the same way as variables treated at the **lf** level, that is, as bound variables. Moreover, as we saw in

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[2] For definitions (8) and (9) see Neale (1993).

[3] Anyway, it should be noticed an important distinction between the LF structure (10) and the RQ **lf** (11): the presence of the logical conjunction '&' in the latter, which separates the two open sentences in the restricted quantifier.

chapter one, at LF level, traces created by the QR rule admit an immediate assimilation to bound variables. Consequently, it is plausible to formulate the following generalization, based on suggestions made by Quine (1960) and Geach (1962): pronouns that, at LF level, are anaphoric on non-referring expressions or quantifiers, operate as bound variables at **lf** level. This generalization can be easily applied to our examples (5)-(7). For instance, for (5) ('every woman buys a book she disapproves of') we generate something like the RQ **lf** structure in (12) below. (12) matches the truth-conditions associated with (5).

(12) [every x: woman x] ([a y: book y & x disapproves y] (x buys y))

On the other hand, if, at LF, we understand the pronoun *she* of (5) as coindexed to a trace, then a bound variable interpretation of the pronoun seems inevitable, as shown in (13).

(13) $[_{NP}$ every woman$_1$ $]_1$ $[_S [_{NP} [_{NP}$ a book $_2]$ [e_1 disapproves of e_2] $]_2$ $[_S$ e_1 buys e_2]].

Thus, e_1, which stands for *she* in the LF (13), can clearly be understood as the occurrence of the variable 'x' in **lf** (12). Furthermore, any other Tarskian structure representing (5) in a different way should be directly isomorphic to (12). That is to say, any Tarskian-motivated structure should be compatible with a treatment of (5), which describes the pronoun in question as a bound variable at the syntactic level. In this way, it seems that both the syntactic and the semantic challenge above are simultaneously satisfied within the framework of a unified theory of semantic representation.

The bound variable approach, however, faces immediate problems when considering examples such as (14)-(16) below.

(14) Mark caught *some fish* and Jim cooked *them.*
(15) If *Mark* agrees with *a* neighbour, then Jim always disagrees with *him.*
(16) *Just one lecturer* was dismissed and then *he* complained to the comission.

From a semantic point of view, it is easy to envisage the difficulties. If we take for instance, the sentence (14) and formulate its RQ **lf** as in (17), the interpretation obtained becomes unacceptable.

(17) [some x: fish x] (Mark caught x & Jim cooked x)

According to the usual interpretation of the bound variables in (17), that sentence can be true under the assumption that Mark caught twenty fish and Jim cooked just two of them. However, under such an assumption clearly (14) will be false since it requires that each fish caught by Mark be cooked by Jim. Moreover, the bound variable theory as applied to (14) goes against the standard logical analysis of conjunction if the theory is extended to other more complex cases. For although the theory in question entails—correctly—each conjunct of (14) separately ('Mark caught some fish' and 'Jim cooked some fish'), it cannot do so when applied to e.g. (16). In this latter case, since the scope of the quantified phrase *just one lecturer* covers the second conjunct, the pronoun *he* will be interpreted as bound by that phrase. Consequently, the theory in question will provide an incorrect analysis of the sentence, like in (16') below.

(16') [Just one x: lecturer x] (x was dismissed & x complained)

Structure (16') is wrong as an analysis of the logical conjunction in (16) because its truth cannot license the correct entailment of (16") below. That is to say, the correct entailment of the first conjunct of (16). This is due to the fact that the truth of (16') is compatible with the falsity of (16")—i.e. with a reading of (16) according to which more than one lecturer was dismissed—whereas it is incompatible with the truth of (16).

(16 ") [Just one x: lecturer x](x was dismissed)[4].

Now, to explain what is wrong with the syntactic representation of sentences like (14)-(16) we must go back to some definitions and principles that we introduced in chapter one, section 1.2: the definition of the notion of c-command, the Binding constraint (BC) and the General Scope principle (GSP). From these principles, it is

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[4] For these and other problems with the bound variable analysis, see Neale (1990) and Evans (1977, 1980).

possible to derive the following crucial *anaphora binding constraint* (ABC).[5]

(ABC) A pronoun P anaphoric on a QNP Q is interpreted as a bound variable if and only if Q c-commands P ,i.e., Q has scope over P. [6]

In order to illustrate the application of the previous principles we will discuss again sentence (14). Since no special constraints have been stated to deal at LF with the sort of syntactic coordination that connectives like *and* and *or* create at surface level (SS), we may generate for (14) the standard LF structure in (18).

(18) $[_S\ [_S\ [_{NP}$ some fish$_1$ $]_1$ $[_S$ Mark caught e_1]] and $[_S$ Jim cooked *them*]].

However, the phrase *some fish* in (14) cannot c-command the third S node (the second coordinate clause) containing the phrase *Jim cooked them* since, according to the c-command definition, the latter phrase is not immediately dominated by the S node created by the QR rule. Given c-command and (GSP), it follows then that *them* in the third S node of (18) cannot be considered as falling within the scope of the QNP *some fish* either. Therefore, according to (ABC), the pronoun *them* cannot be treated as a variable bound by that QNP. In contrast, the purpose of the **lf** structure (17) above is to stipulate scope over the open sentence 'Jim cooked x' and, in doing so, to treat the variable 'x' as bound by the restricted existential quantifier '[some x: fish x]'. Thus, we must conclude that, whatever the value assigned to LF (18), it has no correspondence with structure (17).

The general conclusion to be drawn from our previous discussion is that since both (17) and (18) are clearly unsatisfactory representations of (14), there is a problem in both the semantic and the syntactic side of the LF account. We will attack first the syntactic problem.

[5] See Higginbotham (1980, 1988).

[6] See Neale (1990)

As we saw, within the LF structure (18) the pronoun *them* is not c-commanded. Also, it does not fall within the scope of any other constituent. So we should, in accordance with (ABC), conclude that such a constituent (and any other in a similar position) cannot be interpreted as a bound variable at LF. However, this conclusion seems to threaten some hallmarks of the LF theory, at least in two senses. First, ***prima facie***, we have a case where the crucial analogy between the logical notion of scope and the one that LF semanticists think underlies natural language does not work. As we saw, since the **lf** structure in (17) treats the pronoun as a bound variable, the second occurrence of 'x' is not free at all. However, the LF principles seem now to show the unboundness of the pronoun in (18). Obviously, if real, this divergence in the way of representing scope affects immediately the degree of generality and uniformity that LF theorists sought to gain in positing the aforementioned analogy between the LF level and the **lf** level.

Second, the application of a direct mapping to Tarskian structures seems also to be threatened and, thereby, the application of the Compositionality Principle to LF structures. For instance, the S node 'Jim cooked them' in (18) cannot be directly mapped into the conjunct 'Jim cooked x' in (17) because the S node should be interpreted as specifying a free variable at the **lf** level. Nevertheless, if, in a syntactic structure S' associated with a sentence S, one of its pronominal constituents can be interpreted as a FOC free variable, then S' cannot be mapped into any well-formed structure of such a calculus. Thus, a strict conception of compositionality seems to collapse in this point, if we accept the conclusion that there are unbound pronouns at LF and that they must be interpreted as free variables.

The issue at stake can be stated by means of the following question, Is it possible, in principle, to adhere to an LF treatment and, nevertheless, tolerate the presence of unbound pronouns at the level of interpretation of LF structures? In our opinion, the most sound and successful answer to that question has been offered by Neale (1990, 1992, 1993).[7] The guiding idea of Neale's answer, we believe, is to demonstrate that LFs equipped with unbound pronouns can secure systematic LF-lf mappings of the aforementioned problematic sentences, despite the fact that the LF structures contain real unbound pronominal constituents. The main payoff that Neale's proposal promises us then is that referentiality and compositionality are not touched. In order to achieve such explanatory and descriptive success, Neale introduces new rules at LF and, as consequence of that, modifications in lf and LF structures are generated. Since we take Neale's proposal to be the most successful attempt at formulating a solution for non-c-commanded pronouns within a syntactically-motivated framework, we think that such a theory deserves to be examined thoroughly. Therefore, in the following sections we shall discuss Neale's theory of unbound anaphora extensively and evaluate its pros and cons.

3.2 Neale's Theory of Unbound Anaphora: the Basic Analysis

However the binding issue is to be solved, it should be clear that to argue for the view that there are unbound pronouns is not "to deny that a pronoun P may be *anaphoric on* a quantifier Q that does not c-command it at LF" (Neale 1993, p. 805). So, it is the anaphora itself and the import of the pronoun in it that is in need of an entirely new analysis. This shift in the focus of the explanation of anaphora is not a minor one. Our previous syntactic representations allowed us to understand how a quantified antecedent binds pronouns, but they remained rather silent about the contribution—if any—of the pronouns to the representation of anaphoricity. This is the result of the fact that the LF approach described in the previous section was conceived primarily within the quantificational tradition of non-deictic anaphora (see chapter one, section 1.1). That is to say, within the tradition that sees non-deictic pronouns as logically reflecting their quantified antecedents. Thus, many LF theorists argue that it is the quantified antecedent

[7] Direct antecedents of Neale's views are Davies (1981) and Evans (1977, 1980).

and its syntactic properties at LF that explains the distinction between deictic (or referential) and non-deictic pronouns.[8] In short, it is the quantifier that matters, not the pronoun. Therefore, the challenge for LF theorists like Neale, who disagree with the quantificational view, is to explain how we may generate LF representations where the pronoun is the determinant of the interpretation of the anaphoric sentences .

In order to explain how Neale's theory achieves that goal, we will examine those anaphoric sentences that will be the main focus of this essay, namely, sentences exhibiting so-called ***donkey*** anaphora. This type of anaphora is rather a species of unbound anaphora. In particular, donkey pronouns are similar to the ones of sentences (14)-(16) in their being non-c-commanded by their antecedents. However, unlike of the pronouns of (14)-(16), donkey pronouns are not constructed on coordinate-clause structures. Also, their quantified antecedents appear embedded in other quantified NPs. The following are classical examples, discussed first in Geach (1962):

(19) Every man who owns [a donkey]$_1$ beats *it*$_1$.
(20) Every owner of [a donkey]$_1$ beats *it*$_1$.
(21) Every farmer who owns [five sheep]$_1$ vaccinates *them*$_1$.
(22) Every student who borrows [some books]$_1$ from the library returns *them*$_1$ on time.

The most interesting aspect of these sentences is that the quantificational force of the antecedents of the pronouns is apparently modified. For instance, sentence (19) seems to assert that each donkey owner beats ***all*** the donkeys he owns. That is to say, the apparent existential force of the indefinite NP *a donkey* changes to the force of a universal quantifier of the type *all donkeys that he owns*. The same occurs, e.g. with the sentence (22). Therein the quantificational force of the antecedent *some books* becomes equal to *all books that he/she borrows*. It is easy to envisage that this modification of the quantificational force of the antecedent will generate the same binding problem posed by sentences (14)-(16). So, the (unrestricted) FOC representation of sentence (19) (and sentence (20)) given in (23) below will misrepresent the truth-conditions of the former

[8] See May (1985, p.25)

in the same way that (17) does with (16). That is to say, the logical structure (23) cannot capture the universal binding of the pronoun by its antecedent.

(23) $(\forall x)(\exists y)[(\text{man } x \ \& \ (\text{donkey } y \ \& \ x \text{ owns } y)) \rightarrow (x \text{ beats } y)]$.

Furthermore, the possibility suggested in (24) is worse as it contains the free variable 'y' in the consequent.

(24) $(\forall x)[(\text{man } x \ \& \ (\exists y)(\text{donkey } y \ \& \ x \text{ owns } y)) \rightarrow (x \text{ beats } y)]$.

Neale's strategy contrasts sharply with this defective account. His solution consists in mapping LF representations of sentences like (19) (or (20)) into If representations, which are quite different from the ones in (23) or (24). From a strictly syntactic point of view, Neale's proposal relies to a large extent on some views about LF and QR construals expounded mainly by May (1985). According to May, structure (25) below represents the LF of (20)—applicable with slight modifications to (19) as well.

(25) $[_{S'} [_{S} [_{NP} [_{NP}$ a donkey $]_2 [_{NP}$ every owner of e_2 $]]_3 [_{S}$ e_3 beats it$_2$ $]]]$.

Structure (25) is derived by successively applying the QR rule—first, to the S original node (i.e. adjoining the NP_3 *every owner of a donkey* to S) and then to the NP thus created (i.e. adjoining the NP_2 *a donkey* to NP_3). Notice that (25) incorporates an important (for May presumably the most important) syntactic modification at LF level: the QR rule does not just adjoin NPs (i.e. embedded quantified phrase) to their S-structures, it can adjoin NPs structures to other NPs structures as well. As May points out, if we assume that LF-movement exhibits properties of a syntactic (or transformational) movement—the rule 'Move α', then the QR rule can be seen as freely instantiating such a movement without any further constraint.[9] Moreover, it is worth stressing something

[9]Move α is a single and very general transformation rule in GB theories, which allows us to move anything anywhere. Movements allowed by the rule may be classified as either substitution or adjunction. Finally, α is a variable ranging over syntactic categories.

elementary about the structure (25): it does not correspond to the SS of (20) above. At SS level, grammar tells us that the indefinite phrase *a donkey* belongs to only one constituent in (20)—i.e. to the quantified NP *every owner*—and that the indefinite operates as modifier of this NP. In particular, it does so by means of the genitive case preposition *of.*

Anyway, LF (25) poses some technical problems. The most serious is that any of the NPs therein can have wide scope (since they c-command each other) and, accordingly, we can end up with rather counterintuitive scope readings.[10] At first sight, the shared views by May and Neale about LF—for instance, the view that (ABC) holds at LF level instead of SS level—commits Neale's theory to structures like (25), where all possible scope assignments for (20) are revealed.[11] However, the attractiveness of Neale's theory lies in its semantic side. That is, in the way that the theory generates restricted quantifier **lf** structures for sentences exhibiting donkey anaphora. As we shall see, once those structures are generated, we can easily handle and dismiss undesirable scope assignments, based on semantic considerations.

The guiding idea of Neale's semantic analysis of donkey pronouns is mainly inspired by work done by Evans in the 70's (Evans 1977, 1980).[12] Based on Evans's proposal, Neale contends that donkey pronouns can be interpreted as—they 'go proxy for'—definite

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[10] In this particular case, NP_2 can take wide scope, i.e. it can generate a potential reading of (25) that represents the situation where, in May's words, "a single, communally owned donkey is beaten"(May 1985, p.73).

[11] There are some technical reasons behind this commitment. Probably most important of all—for Neale, May and other LF-theorists—is that if we don't accept that binding constraints, c-command and the like, hold at LF (rather than at SS), then we have a problem to explain 'inverse linking' sentences like (i) below.

(i) Somebody from [every city]$_1$ despises *it*$_1$

Likewise, the acceptance of the structure (25) (where an NP is raised and adjoined to another NP and not to a S node) seems to be needed for explaining some *wh*-sentences like (ii) below. See May (1985, pp.69-70) and Neale (1990, pp. 191-194).

(ii) What does somebody from every city despise ?

[12] Similar ideas can be traced back to Parsons (1978), Cooper (1979) and Davies (1981).

descriptions or, by using the term Evans coined, they are E-type pronouns.[13] On this analysis, the anaphoric relation does not arise through the binding of the pronoun by its quantified antecedent. Rather, it is the common descriptive material and the uniqueness presupposition imposed on the definite description that ensure that both the antecedent and the pronoun denote the same object(s). Intuitively, this means that donkey (and unbound) pronouns can be interpreted (in a way to be specified by LF constraints) as descriptions of the form *the F* or *the F that is G*. Thus, the interpretation process takes place in the course of trying to fix the descriptive content of the pronoun and is not a consequence of fixing its connection (as a trace) to an LF structure. According to Neale, the descriptive content of the pronoun is ***directly*** reconstructed. That is to say, the pronoun is descriptively reconstructed according to a rule that, by respecting Tarskian and LF constraints, copies lexical material just from the antecedent, without any additional processing. Finally, as Neale recognizes, whereas pragmatic factors have some bearing on the complete specification of the description in question, they are explicitly left out of the rule of reconstruction of pronominal content.[14]

We will first introduce a technical version of Neale's recovery rule (as formulated in Neale 1993) and then a simpler and informal version. The interest of the technical version lies in the fact it is formulated in terms of *k*-th variables and scope relations and, therefore, shows how Neale's proposal can be systematically connected with both the Tarskian background and the LF theory. The version is as follows:

(DP) If a pronoun P_k is anaphoric on but not c-commanded by a QNP '$[\,Q_k\!: \alpha]_k$' with

[13] Anyway, there remains an important difference between Evans' E-type pronouns and pronouns that go proxy for definite descriptions, namely: the Kripkean rigidity of E-type pronouns that Neale rejects. According to Evans (Evans 1977, 1980) E-type pronouns are descriptions that have their referents *rigidly fixed* in Kripke's (1972) sense. Thus, they are a mixed category. In Neale's words "they are not genuine referring expressions [...] but they *are* supposed to be rigid descriptions"(Neale 1990, pp.184-185). Instead, Neale's pronouns are *Russellian descriptions*. Hence they are fully non-referential in nature as FOC quantifiers are. In particular, they give rise to scope ambiguities in both extensional and intensional contexts. For an extensive discussion of the difference between Neale's and Evans' treatments see Neale (1990, pp.184-191).

[14] This acknowledgement suggests, as we shall see in the following chapter, that Neale thinks of donkey pronouns as to a certain extent underspecified. See Neale (1990, pp. 184, 261).

scope[15] β, then P_k is understood as '$[\text{the}_k{:}\alpha \,\&\beta\,]_k$'.

In Neale's words, DP expresses the idea that the pronoun P is understood "as a definite description typically recovered from Q and everything Q c-commands at LF" (Neale 1993, p. 813). Moreover, from DP, it follows that although the unbound pronoun can still be treated as the *k*-th variable of a sequence, it is not going to receive the interpretation associated with a variable 'x_k' falling within the scope of the quantifier '$[Q_k{:}\ \alpha]_k$'. Finally, DP shows that the descriptive content of the pronoun will correspond (usually) to the N' restriction—α—and the scope—β—of the determiner 'Q_k'. Neale calls the pronouns recovered by DP rule, **D-type** (rather than E-type) pronouns.[16]

The whole significance of the above rule can be preserved in a less technical but more intuitive formulation. We will choose that stated in Neale (1990) and termed **P5** rule. It is formulated in the following terms:

(**P5**) If x is a pronoun that is anaphoric on, but not c-commanded by, a quantifier '[Dx:Fx]' that occurs in an antecedent clause '[Dx:Fx] (Gx)', then x is interpreted as the most "impoverished" definite description directly recoverable from the antecedent clause that denotes everything that is both F and G (Neale 1990, p.182).

P5 behaves quite intuitively indeed. For instance, **P5** says to us that the pronoun *she* in the second sentence of (28) can be recovered as in (29) below. Therefore, it dictates that interpretation of the pronoun in question matches clearly our intuitions about the anaphora in the second sentence in (28).

(28) [A woman]$_1$ came in. *She*$_1$ sat down.
(29) *The woman who came in* sat down.

As for restricted quantifier notation, the definite description in (29) and, consequently, the sentence (28) can be represented by means of the RQ **lfs** (30) and (31), respectively.

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[15] According to the definitions in chapter one, section 1.2, syntactic scope is the open formula to the right of the (restricted) QNP that states what is true of the domain of individuals in the quantifier.

[16] Neale borrows the term from Sommers (1982).

(30) [the z : woman z & z came in] (z sat down)
(31) [an x : woman x](x came in) & [the z: woman z & z came in] (z sat down)

Before going to other applications, two general points should be emphasised concerning Neale's solution. First, pronouns are not 'descriptively replaced' by their antecedents. In semantic terminology, D-type pronouns are not 'lazy' constituents waiting for a replacement when syntactic analysis takes place.[17] In such a case, as Larson and Segal emphasise, unbound pronouns 'are simply not present' at the relevant syntactic level.[18] Since, according to Neale, recovery of the descriptive material of a donkey pronoun is the result of an interpretive, subject to rule, process, a 'laziness' treatment is, consequently, incompatible with his proposal.

Second, on Neale's view, unbound pronouns become quantificational in virtue of their being equivalent to Russellian definite descriptions (Neale 1990, 1993, Ludlow and Neale 1991). This gives Neale's conception of pronouns two important advantages when compared with quantificational treatments of unbound anaphora. The first obvious advantage is that a Russellian conception does not impose special assumptions about scope in order to capture the connection between the pronoun and the antecedent. Quantificational treatments of the pronoun in question, by contrast, must alter standard assignment of scope to achieve correct interpretations of the anaphora sentence. An example of such treatments has been offered by Geach (1970). According to Geach's suggestion, the sentence (28) can be represented by means of the FOC structure in (28').

(28') $(\exists x)($ x is a woman & x came in & x sat down)

This solution has several problems, perhaps the most obvious one being that if the

[17] Geach (1962). Lazy pronouns go proxy for repeated ocurrences of nouns. Some examples are the following:

(i) People who buy books tend to read *them*.
(ii) Running is healthy. *It* is funny too.

[18] Larson and Segal (1995) p. 405. See Parsons (1978) for a proposal along these lines.

discourse contains further anaphoric pronouns, the scope of the quantifier must be altered. Thereby, the evaluation of the truth-value of the sentence containing the first pronoun could never be considered definitive. This seems to conflict with our intuition that utterance of an indicative, univocal, sentence in discourse "expresses some proposition or other (relative to the context of utterance) and hence ought to be evaluable for truth or falsity" (Neale 1990, p. 170). Thus, at least from a formal point of view, structure (31) is more acceptable than (28'). The second advantage of a Russellian conception of pronouns concerns object-dependent reference. **P5** recovers the descriptive content of the pronoun in terms of conditions—provided by a quantificational structure—that certain individuals satisfy and not in terms of their direct reference. Thus, the content of donkey pronouns is not specified in terms of object-dependent conditions. [19]

Let us consider now problematic cases (19) and (20) again. We will represent first the QNP *every man who owns a donkey* of (19). The RQ **If** that Neale's theory generates for that QNP is the following.

(32) [every x : man x & [a y : donkey y] (x owns y)].

Structure (32) allows us to clearly represent the restrictive relative clause *who owns a donkey,* in (19). In restricted quantifier structures, relative pronouns like *who* are treated as variables bound by the determiner affecting the whole restrictive relative clause, in this case, by the determiner *every man.* Thus, we attach to the original restriction of the QNP, by using the conjunctive particle '&', the quantificational phrase binding the variables of the restrictive clause. By doing so we obtain the schema '[Qx: Fx & [Qy: Gy](Pxy)]', which is reflected in (32). Moreover, we know that, at LF level, relative pronouns must be c-commanded by their determiners. Now, since the pronoun *it* in the matrix VP of (19) is not c-commanded by its antecedent, the pronoun, according to (ABC), cannot be characterized as a bound anaphora. In consequence, **P5** determines its descriptive content. As the antecedent of *it* is constituted by the indefinite and everything it c-

[19] See Larson and Segal (1995, p 402)

commands at LF—i.e. '[a y: donkey y](x owns y)', the most impoverished definite description specifying the content of the pronoun will be the one in structure (33) below. Thus, the final representation of sentence (19) will come out as (34) below.

(33) [the y : donkey y] (x owns y)

(34) [every x : man x & [a y : donkey y](x owns y)]
([the y: donkey y & x owns y] (x beats y))

Evidently, structure (34) represents the correct truth conditions that speakers intuitively will assign to (19), that is, that every man who owns at least one donkey beats all donkeys he owns.

Plural instances of donkey anaphora like in (21) above can also be adequately treated by Neale's descriptive proposal. (35) is the RQ structure that such proposal generates for (21).

(35) [every x : farmer x & [five y : sheep y](x owns y)] ([the y: sheep y & x owns y]
(x vaccinates y)).

By simple inspection, structure (35) provides the correct truth conditions of (21). In prose, (35) says that every farmer who owns five sheep vaccinates the five sheep he owns.

Before considering some major issues connected with Neale's initial solution, a minor one about scope needs to be considered. In (34) '[the y: donkey y & x owns y](x beats y)' is the formula attached to the right of the formula '[every x : man x & [a y : donkey y] (x owns y)]'. Thus, it follows that the former formula corresponds to the scope of the restricted quantifier represented in the latter formula. Consequently, we are entitled to say that the variable 'x' in the first formula ends up bound by that quantifier.

Now we will show how Neale's theory manipulates sentences with unbound pronouns such as the ones exhibited in sentences (14)–(16) above. Let us consider first (14). Its RQ

If, according to Neale, will be (36) below.

(36) [some y: fish y](Mark caught y) & [the z: fish z & Mark caught z](Jim cooked z)

In structure (36), the pronoun *them* is a D-type pronoun whose content is recovered from the first coordinate structure. This allows us in turn to obtain the correct truth-conditions for the anaphora sentence of (14). That is, that Jim cooked ***all*** the fish Mark caught. Working the same way with (16), we get a similar description, which is shown in (37).

(37) [just one x: lecturer x] (x was dismissed) & [the z: lecturer z & z was dismissed] (z complained to the commission).

We see now that, whereas structure (37) entails its two conjuncts, its truth is incompatible with the falsity of either. That is to say, the truth of (37) is incompatible with a situation where two or more lecturers are dismissed.

Finally, the potential of Neale's theory can be additionally tested by confronting it with the following complex example from Heim (1982).

(39) Every boy who likes [his mother]$_1$ visits *her*$_1$ at Christmas.

Now we have two anaphoric links interacting with each other. The possessive phrase *his mother*, embedded in the restrictive clause *who likes*, is the antecedent of the D-type pronoun *her*, which is not within the scope of the possessive phrase. The antecedent of the pronoun *his* in the possessive phrase is the restricted quantifier *every boy*. Since the pronoun *her* clearly is not c-commanded by its antecedent, by **P5** it goes proxy for a definite description. The content of the pronoun is then recovered from another definite description, i.e. from *the mother of every boy*, which corresponds, in turn, to the pronoun *his* in the restrictive clause. The result will come out as the following RQ **If** structure.

(40) [every x: boy x & [the y: y mother of x](x likes y)] ([the y: y mother of x] (x visits y at Christmas))

It should be clear that structure (40) assigns the correct truth conditions to sentence (39). That is to say, (39) is true if and only if each boy who likes his mother visits her at Christmas.

3.3 Uniqueness, Numberless Hypothesis and D-type pronouns

As indicated in the last section, the main virtue of **P5** is that it allows us to treat donkey pronouns as semantically equivalent to definite descriptions whose content is recovered from the quantified antecedent. **P5**, also, remains compatible with LF constraints since it does not transform the status of non-c-commanded constituents into anything else. The result is a successful treatment of donkey pronouns as unbound ones at LF level. Nevertheless, there are two other apparent virtues of Neale's account when compared with other donkey anaphora accounts. Thus, we will examine carefully these virtues.

First, according to Neale, his theory provides an analysis of donkey sentences that "(a) delivers the correct (Geachian) truth conditions, and (b) honours a Russellian treatment of singular indefinite descriptions" (Neale 1990, p.236). We can explain both claims as follows. Geach (1962) suggested that a natural formulation of the semantic content of sentences like (19) can be stated by means of the FOC structure in (41).

(41) $(\forall x)(\forall y)((\text{man } x \ \& \ (\text{donkey } y \ \& \ x \text{ owns } y)) \rightarrow (x \text{ beats } y))$

By simple inspection, structure (41) is logically better than the **lf** (24) of the last section—it does not contain any free variable, and semantically more felicitous—it captures effectively the apparent universal binding of the donkey pronoun. However, the semantic felicity of (41), in Neale's opinion, is not a consequence of any 'universal' force additionally associated with the indefinite QNP *a donkey* in (19). He formulates the point as follows:

> The universalization of the indefinite description 'a donkey' in [(19)] is a logical illusion: It is the *pronoun* that has universal force, by virtue of standing in for a definite description (Neale 1990, p.236)

This suggests why Neale rejects the idea that the antecedent QNP is what determines the anaphoric connection in donkey sentences. For Neale, the conception of the indefinite description *a donkey* as a type of 'hidden' universal quantifier directly blocks the construction of a systematic and compositional semantic theory. Consider his explanation of the point in the following passage:

> We want a *systematic* deliverance of truth conditions, a theory that projects the truth conditions of sentences on the basis of the "meanings" of their parts and their syntactical structures. And on this score, treating indefinite descriptions in (and only in) certain subordinate structures as devices of wide-scope universal quantification is, at best, a tottering first step. Such a treatment gives us *no* explanation of the apparent "universalization" in [(19)]. (Neale 1990, p.225).

Neale's defence of his Russellian proposal relies on the indisputable necessity of preserving as much as possible, the referentiality and compositionality of the truth-conditional semantics. In contrast, the quantification or binding treatments of donkey sentences sacrifice the desired compositionality of the semantics and thereby they fall short of explaining in a systematic way such sentences. This argument, we believe, is theoretically cogent. However, it depends, in turn, on the defence of a strict application of the Compositionality Principle in all contexts. Thus, if such an application can be reasonably disputed, Neale's defence can be challenged as well.[20] In addition, Neale's defence seems to entail the following conditional: if Geachian truth-conditions, as the ones shown in If structure (41) above, represent the intuitive meaning of standard donkey sentences, then no additional parameters specifying the interpretation of donkey sentences are needed. As we shall argue, there is rather overwhelming evidence indicating that this conditional cannot be correct.

The second virtue of Neale's analysis is, we believe, more compelling. It has to do with an immediate problem that any account interpreting donkey pronouns as definite descriptions in disguise is bound to confront. The problem is that, given the standard Russellian interpretation of definite descriptions, donkey pronouns must imply a ***uniqueness*** presupposition or condition. The following example seems to reinforce this conclusion.

(42) Every man who has a daughter thinks she is the most beautiful girl in the world.

As Neale indicates, on the Geachian reading, "the truth of [(42)] entails that every man who has more than one daughter has contradictory beliefs" (Neale 1990, p. 228).[21] However, both Neale and others consider that issues about uniqueness implications seem more related to pragmatic than semantic intuitions. For instance, apparently in the following examples we would not expect uniqueness implications:[22]

(43) If Mark agrees with [a waiter]$_1$, then Jim always disagrees with him_1.
(Larson and Segal 1995)
(44) No father with [a teenage]$_1$ son lends him_1 the car on weekdays. (Rooth 1987)

[20] Strict application of the Compositionality Principle takes sometimes the form of a mapping hypothesis between semantic and syntactic structures, the so-called 'rule-by-rule' hypothesis; for more details on compositionality see Partee (1996).

[21] It is worthwhile to notice that this statement does not guarantee that Geach's reading (41) implies uniqueness in all contexts.

[22] For discussion see Chierchia (1995), Heim (1990) and Kadmon (1990).

In (43) and (44) the pronouns remain in unbound positions and this suggests Geach's analysis can be used without appealing to uniqueness. For example, in (44) we cannot confine our attention to fathers with just one teenage son. Otherwise, our intuitions about the truth-conditions of the sentence would become shaky; e.g. if a father who has more than one son lends the car to some but not all of them (in the following section we discuss again uniqueness). Thus, it seems that we need a systematic solution that avoids commitments to uniqueness implications and preserves Geachian truth-conditions. The solution Neale proposes is, in our judgement, both sensible and natural. He says:

> One interesting idea is that in many such cases unbound anaphoric pronouns go proxy for definite descriptions that are, from a semantical perspective, *numberless*. (Neale 1990, p.234).

Neale's proposal is constructed on the suggestion—borrowed from Moore (1944)—that expressions like *whoever wrote Waverley* may be translated as definite descriptions that are neutral with respect to semantic number. That is to say, those expressions can be indifferently read as singular or plural QNPs. So, if '[whe x: *F*x]' represents the numberless description *the F or the Fs,* the following set-theoretical definition of the description in question can be stated.

(45) [**whe** x: *F*x] (*G*x) is true iff $| \mathbf{F} - \mathbf{G} | = 0$ and $| \mathbf{F} | \geq 1$

Neale also concludes that if antecedents of D-type pronouns are number-neutral, then we should interpret D-type pronouns "anaphoric on quantifier phrases of the form 'every F', 'all Fs', and 'each F' as semantically numberless" (Neale 1990, p.235).

Neale's proposal is ready to respond to two possible objections, from the syntactic as well as the semantic side. The syntactic objection is based on the fact that the indefinite antecedents of donkey pronouns are syntactically ***singular*** ones. If this is the case, Does Neale's hypothesis entail that such antecedents are really ambiguous at surface level?

Neale's response to this question is direct: there is no problem about the syntactic singular nature of D-type pronouns. The only reason for suggesting that semantic numberlessness implies syntactic numberlessness would be to assume that indefinites themselves are lexically ambiguous. So, they would be read as both plural and singular determiners. This view, that has been voiced by some theorists, is plainly rejected by Neale[23] (we are not going to consider Neale's particular arguments on this issue here because in the following chapter we shall discuss several arguments against the lexical ambiguity view.) Thus, for Neale, indefinite antecedents remain syntactically singular in number at surface structure. The issue for him is whether or not those antecedents can generate genuine *cardinality implications* when we recover the descriptive content of the pronouns anaphorically related to them. It should be clear that other determiners cannot—despite their difference in syntactic number. For instance, the equivalent sentences (46) and (47) below—whose determiners *every* and *all* differ in syntactic number—allow us to recover the content semantic of the pronouns in (48) and (49) without considering the cardinality implications of the determiners.

(46) Every new philosophy lecturer knows logic.
(47) All new philosophy lecturers know logic.
(48) *Every* new philosophy lecturer knows logic. *He* is supposed to teach the matter once a year.
(49) *All* new philosophy lecturers know logic. *They* are supposed to teach the matter once a year.

If, in (48) and (49), we introduce the cardinality implications deriving from the syntactic number of the antecedents into the descriptions of the pronouns *he* and *they*, we will get wrong truth-conditions for the sentences. That is to say, the two sentences will not be equivalent, as they should be. For, by **P5**, the pronoun in (48) will be rendered as *the new philosophy lecturer* and the pronoun in (49) as *the new philosophy lecturers*. On these analyses, (48) will be false if there is more than one lecturer and (49) will be false if there

[23] See Neale (1990,pp.252-253); see also Hintikka and Carlson (1978) for other criticisms of such a view.

is exactly one lecturer.[24] These incorrect predictions are inevitable if we accept that in the cases in question the anaphoric pronouns "have added *cardinality implications* not supplied by their antecedents" (Neale 1990, p. 235). Consequently, the numberless hypothesis seems the natural alternative to take in such cases. As for donkey sentences, the main concern, however, are cases of indefinite antecedents. In particular, we should examine cases where the indefinites are embedded in broader constituents. Let us first examine simpler cases, for example, (50) and (51) below.

(50) Every philosophy lecturer borrowed a book from the new Library
(51) Every philosophy lecturer borrowed some books from the new Library.

Against normal intuitions, literal analysis of the meaning of the indefinite noun phrases *a book* and *some books* in (50) and (51) suggests that the truth-conditions of the sentences cannot differ. This claim implies, for instance, that if every lecturer borrowed more than one book, we have to (rather controversially) accept that both (51) ***and*** (50) are true, and that if every lecturer borrowed just one book, both (50) ***and*** (51) are true. This controversial aspect vanishes once one considers more complex situations. For instance, a situation in which one or two lecturers borrowed exactly one book and the rest more than one. Under that scenario, we would not like to declare sentence (51) false. And the truth of (50) is a logical implication of (51)'s being true. All these situations force us, according to Neale, to stick to a semantic analysis that suggests interpreting both *a book* and *some books* by means of the cardinal paraphrase 'there is at least one...'. In other words, we are forced to stick to the Russellian analysis of such quantified phrases. Neale states the point as follows:

> On Russell's account, a sentence of the grammatical form 'An F is G' has the same logical form as a sentence of the form 'Some Fs are Gs'. In the notation of [restricted quantifiers], '[an x: Fx](Gx) ' and '[some x: Fx](Gx)' are logically equivalent; both are true if and only if there is at least one F that is G. On a *completely* Russellian account

[24] Neale (1990, p.234).

> of indefinite descriptions, then, since there can be no difference between the truth conditional contributions of 'a donkey' and 'some donkeys', the same must be true of the complex noun phrases (i) 'every man who bought a donkey' and (ii) 'every man who bought some donkeys'.(Neale 1990, p. 235)

Thus, sentences (52) and (53) will be treated along the lines of (48) and (49) above.

(52) Every philosophy lecturer borrowed [a book]$_1$ from the new Library and then he returned *it*$_1$.
(53) Every philosophy lecturer borrowed [some books]$_1$ from the new Library and then he borrowed *them*$_1$.

Although the QNPs *a book* and *some books* differ in syntactic number, clearly that number does not introduce cardinality implications in the description of the pronouns anaphoric on the QNPs.

We can now represent the complex donkey cases (19)—repeated below as (54)—and (55) below by using the *whe* operator. The generated RQ structures are (56) and (57), which, according to definition (45), are semantically equivalent.

(54) Every man who owns [a donkey]$_1$ beats *it*$_1$.
(55) Every man who owns [some donkeys]$_1$ beats *them*$_1$.
(56) [every x: man x & [**a** y: donkey y](x owns y)] ([**whe** z: donkey z & x owns y] (x beats y)).
(57) [every x: man x & [**some** y: donkeys y](x owns y)] ([**whe** z: donkey z & x owns y] (x beats y)).

We turn now to consider the objection formulated from the semantic side against Neale's numberless hypothesis. The semantic objection is quite simple. It says that (54) and (55) have different truth-conditions after all. Consequently, even if (56) captures the force of (54), (57) misrepresents the force of (55) since the truth of (55) does not depend on what happens with owners of just one donkey. This objection misses the point if its target is the treatment of the ***pronoun*** in (55)—what really matters in Neale's theory. But Neale agrees the objection is maybe correct if its target is the use of the Russellian treatment of ***plural indefinites*** in order to analyze the antecedents. In short, in the latter case the objector "is contesting Russell's claim that 'An F is G' and 'Some Fs are Gs' are equivalent. In short, the objector is urging the following split:

(✻3_1) 'Some *F*s are *G*s'	is true iff	$\lvert \mathbf{F} \cap \mathbf{G} \rvert > 1$
(✻4) 'An *F* is *G*'	is true iff	$\lvert \mathbf{F} \cap \mathbf{G} \rvert \geq 1$ " (Neale 1993, p.236).

However, rejecting Russell's analysis of plural indefinites poses no problem to Neale's proposal. For the different truth-conditions to be assigned to each (indefinite) determiner will be a consequence of analysing further the antecedents but ***not*** the pronouns, which will still remain a unified semantic category. Thus, plural indefinite descriptions may carry cardinality implications with them. Concerning *singular* indefinite descriptions, Neale emphasises that no analysis in terms of cardinality is acceptable. His important conclusion is stated as follows:

> But singular ***in***definite descriptions are not ***semantically*** singular; they do not generate uniqueness implications. When we just wish to say that $\lvert \mathbf{F} \cap \mathbf{G} \rvert = 1$,we say 'Exactly one F is G' or 'Just one F is G'. The truth of 'An F is G' does not require that $\lvert \mathbf{F} \cap \mathbf{G} \rvert = 1$, it just requires that $\lvert \mathbf{F} \cap \mathbf{G} \rvert \geq 1$, and this is perfectly consistent with the truth of 'Some Fs are Gs' , even on the non-Russellian analysis of plural indefinites. (Neale 1990, p.237).

3.4 Criticisms of Neale's Proposal

Let us take stock before proceeding to formulate some serious criticisms to Neale's theory. We can sum up the contribution of Neale's analysis in the following three characteristics: (**i**) it permits donkey sentences to satisfy those truth-conditions that are usually associated with them, i.e. Geachian truth-conditions; (**ii**) it treats donkey (and unbound) pronouns, anaphoric on indefinite descriptions, as semantically equivalent to definite Russellian descriptions, whose content is recovered by using a special interpretive rule, **P5**; and **(iii)** it offers an appealing solution, the numberless hypothesis—NH henceforth, to the uniqueness problem, a hypothesis which, according to Neale, preserves Geachian truth-conditions.

During the last five years this initially attractive analysis has come under sharp scrutiny. As a result, Neale's theory faces a set of interesting counterexamples. We want to focus here on a group of them. We term the examples according to their initial formulations and add also some references to important discussions of them (we use here only italics to indicate anaphoric linkage)

(58) Every person who has *a* credit card pays his/her bill with *it*.

(**existential readings**; Pelletier and Shubert (1989), Chierchia (1992, 1995), Kratzer (1988), Kanazawa (1994), van der Does (1993b), Lappin and Francez (1994)).

(59) Every person who bought at least *two* beers here bought five others along with *them*.

(**sage plant cases**; Heim (1990), Chierchia (1992, 1995), Kanazawa (1994)).

(60) Every boy danced with *some girl*. *She* was a ballerina.

(**Telescoping cases**; Sells (1985), Roberts (1987, 1989), Neale (1990), Ludlow (1994), Poesio and Zucchi (1992)).

Sentence (58) raises a problem for Geachian truth-conditions, because it is evident that the donkey pronoun *it* does not have universal force. Admittedly, native English speakers will understand that the pronoun refers to ***some or one*** rather than ***all*** credit cards everybody may carry. That is, (58) does not entail (for English speakers) that everybody who has a credit card pays his bill with ***all*** credit cards he/she has.[25]

[25]Schubert and Pelletier (1989), who first proposed existential readings of donkey sentences—they call them Indefinite Lazy readings—claim, rather contentiously, that such readings are cases of 'generic' or 'gnomic' understanding of donkey sentences (p. 201). However, this view is flawed; see Kanazawa (1994) for discussion.

Sentence (60) represents a challenge for Neale's recovery algorithm, his rule **P5**, when applied across-discourse. Although we cannot discuss all the technicalities yet, the machinery so far gained lends itself to provide a clear picture of why (60) effectively poses a serious problem to Neale's theory. The basic reason lies in the fact that a Russellian treatment of donkey pronouns forces the latter to accept different scope interactions with the rest of the determiners in the sentence. Thus, donkey pronouns must interact with the following wide scope reading of the determiner *every* in the antecedent sentence of (60):

(61) [every x: boy x]([some y: girl y] (x danced with y)).

Although structure (61) does not ***necessarily*** express the preferred reading of the antecedent sentence of (60), there are contexts that would suggest felicity conditions for it (see Sells 1985). Now, on the assumption that this reading is available, how are we to formulate the anaphora sentence of (60)? **P5** stipulates that the pronominal content must be recovered by taking into account the relevant determiner—*some*, its restriction—*girl*—and the scope—*danced with*. Thus, the whole anaphora sentence will come out as structure (62) below

(62) [the y: girl y & x danced with y](y was a ballerina).

However, structure (62) contains a free occurrence of the variable 'x' and therefore is not a well-formed restricted quantifier structure. This incongruence in the theory poses, as Neale recognizes (Neale 1990, pp.260–1), a wider problem concerning the nature of his recovery rule and its capability to bring 'into play' additional contextual information. As we shall see in the following chapters, although Neale heads in the correct direction in order to find out a solution, the problem posed by (60) is much deeper than he suggests.

Finally, sentence (59) requires additional technical apparatus. We are going to deal with such technical matters in chapter five. Nevertheless, it will not be difficult for the reader at this stage to grasp the general problem and some of its consequences. The general issue at stake concerns the extent of application of NH. Let us first consider a similar but simpler example, sentence in (63).

(63) Every person who bought *a beer* bought five others along with *it.*

If we do not attribute numberless assumptions to the antecedent *a beer* in that sentence, i.e. if we attribute to it a uniqueness implication, the only reading of the pronoun *it* that we can recover is the one expressed by the description 'the beer that he/she bought'. However, in such a case we are straightforwardly going to make the contradictory prediction that every person who bought six beers bought the only beer he/she bought. NH liberates us from this inconsistency and others immediately. Conversely, sentences like (63) become strong evidence in favour of the existence of numberless D-type pronouns.[26] We can show that by checking the numberless reading of the pronoun in question in (62). We will get something like the description 'the beer or beers that he/she bought', which entails the truth of the whole sentence just when 'every man who bought at least one beer bought five other beers along with *each of the beers* he bought' (Neale 1990, p. 238; my emphasis).[27] Thus, we are left with a quite nice solution that matches our semantic intuitions and shows the explanatory and predictive power of NH.

Nevertheless, the solution at hand will not be useful if we want to make a wider generalization by using the case instantiated by (63) as a basis. Sentence (59) in particular could not be embraced by such a purported generalization. The reason is that the description that Neale's theory obtains for the pronoun in (63) entails a commitment to a particular semantic aspect, distributivity. That is to say, it entails the existence of a group of one or more beers each of which is connected with each member of another group of five beers by means of the *buying-along-with* relation, as our emphasis in

[26] Neale (1990, 238).

[27] Prof. M. Sainsbury (p.c.) suggests that there may be a worry about infiniteness in Neale's analysis if some temporal clause is not interpolated, i.e. some clause like 'each of beers he ***initially*** bought'.

Neale's explanation above made it clear. This commitment to distributivity must be extended to plural pronouns, and consequently to pronouns such as *them* in sentence (59). Thus, if the distributive description associated with such a pronoun is 'each of the beers' (the numberless effect is irrelevant here), then, in using that description, we will make incorrect predictions in some contexts, e.g. in contexts where one has bought exactly ***six*** beers and not ***seven***, as the sentence implies. For, in such a case, we will get for the whole sentence the reading 'every man who bought at least two beers bought five beers along with each of the beers he bought'. It is not difficult to realize this latter reading could be true in a scenario where everybody bought just six beers.[28]

The interesting point about this criticism is that it reveals the internal limitations of NH and how they are connected with deeper assumptions to which Neale's theory seems strongly committed. One of such aspects is semantic distributivity.[29] The expression *two beers* is an example of a plural noun phrase and, as Neale acknowledges, usually such phrases receive non-distributive or ***collective*** readings.[30] The question to ask is whether D- or E-type pronouns can receive such readings as well. Neale's answer is sceptical. He argues that questions about collectivity or collections are completely orthogonal to the issue of the nature of descriptions and, thereby, of D-type pronouns. Consider the following passage:

> The existence of such [collective] readings raises a variety
> of interesting semantical and ontological issues; but to the
> extent that providing an adequate semantics for sentences
> containing plural noun phrases on their collective readings

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[28] One can visualize this situation as follows: let us suppose that a man bought six beers, a, b, c, d, e, and f and, also, he bought a along with b. On the one hand, if he bought c, d, e and f along with b, he bought five beers along with b. On the other hand, the same will apply to a, since the *buying-along-with* relation is symmetric. This criticism was firstly formulated by Lappin and Francez (1994); see chapter five of the thesis for more detail.

[29] Neale states this commitment by saying "I am confining my talk about plurals and numberless descriptions to cases in which they receive *distributive* readings... It is, of course, the simple distributive reading of the numberless D-type pronoun 'it' in [(62)] that we are interested in "(Neale 1990, p.258,n.34); see also note 31.

[30] See Neale (1990, Ibid.)

> is a very general task that ***has nothing to do*** with descriptions ***per se***, I have not attempted to say anything substantial about collective readings of descriptions. (Neale 1990, p.61, n.62, my emphasis)[31]

3. 5 Evaluation of the Criticisms

As a consequence of the criticisms indicated above, at least three possible evaluations of Neale's proposal might be suggested: (**a**) the proposal is partially wrong—as examples like (58) show—because of characteristic (**i**) above—that is, commitment to Geachian truth-conditions. Therefore, such a commitment should be abandoned or at least relaxed. (**b**) the proposal is partially wrong—as examples like (59) show—because of characteristic (**iii**) above—that is, numberless hypothesis. Therefore, uniqueness and/or something else should be brought back. (**c**) the proposal is either partially wrong—as examples like (60) show—or totally wrong because of (**ii**)—that is, the Russellian treatment of donkey pronouns as definite descriptions. If the first disjunct of (**c**) is true, that treatment should be replaced with an alternative treatment of definite descriptions retaining the rest of Neale's proposal; if the second disjunct is true, the entire proposal should be given up.

The alternative (**a**) suggests, in our opinion, a conception according to which donkey sentences are linguistic phenomena inducing ***semantic non-univocality***. The general

[31] Neale (1990) substantiates his anti-collectivism in several places, for instance, p. 210, n. 23; p.215, n. 46; p.258, n. 33. In p. 210 he rejects in particular the possibility of understanding plural definite descriptions, and thereby plural D-type pronouns, as denoting 'maximal collections'. He says,

> One often hears it said that a plural definite description 'the F' is maximal in the sense that it refers to a 'maximal collection' of Fs (or perhaps to some pragmatically determined maximal collection of Fs). I claim no such thing; indeed, I think such talk is ultimately very misleading, even for collective readings.

As we shall see in chapter five, this statement must be judged, on empirical and philosophical grounds, as ultimately incorrect.

argument in this case is as follows. Donkey sentences can express, when uttered, different propositions. These propositions, although sharing exactly the same anaphoric pattern, can be associated—depending on the interaction between the utterance context and the literal meaning—with either universal readings or non-universal readings. Consequently, we seem to be forced to conclude—to save the grammatical uniformity of the phenomena—that if donkey sentences make available both universal (Geachian) and non-universal (non-Geachian) readings, that is due to some deeper phenomenon having to do with non-univocality of the sentences.

Now, if donkey sentences are really semantically non-univocal phenomena, two questions arise. (**d**) What exactly is the non-univocal phenomenon involved in those sentences? For instance, could it be characterized as being an instance of ambiguity, nonspecificity, or other well-known manifestations of semantic non-univocality? (**e**) Where exactly is such a non-univocality to be located? For instance, could it be located in the (quantified) antecedents, or in the pronouns, or even in the processing of the anaphoric relation itself?

Several answers to the previous questions have been offered. For example, an answer to the first question has been to suppose some type of semantic ambiguity behind donkey structures. The case for semantic ambiguity has been argued in several ways and degrees by Root (1986), Rooth (1987), Groenendijk and Stockhof (1990) and Chierchia(1992, 1995). Concerning the second question, the same theorists have suggested—except for Chierchia—that the ambiguity should be located in the determiners or quantified antecedents of the donkey pronouns. Perhaps the most important consequence deriving from this stance, as we shall see, is that it imposes a modification on our ordinary quantificational logic. In contrast, Chierchia rejects any possibility of locating the purported ambiguity in either the determiners or the pronouns. That rejection affects his view about donkey ambiguity as well. Such a view entails that donkey sentences are ***indirectly*** ambiguous, i.e. they are processed by interpreters ***as if*** they were ambiguous. Furthermore, it follows from Chierchia's proposal that each of the two potential reading associated with donkey sentences will be generated by different treatments or methods.

Since the motivations of this dissertation depend to a great extent on rejecting the whole idea of a donkey ambiguity theory, we will dedicate an important part of the following chapter to a detailed discussion of some of the aforementioned views.

Holding alternative (**b**) means that an E- or D-type theory can be successful only if it assumes as a basic tenet that D-type pronouns carry uniqueness implications. Furthermore, it means that those implications must be appropriately reflected in the structures that the theory generates. This view has been strongly advocated by Kadmon (1987, 1990). As recognized by Neale (1990, p.244), the natural candidate that both dispenses with the idea of numberless D-type pronouns and introduces uniqueness in the descriptive structures is an analysis in terms of quantification over events.[32] Neale formulates the general argument for treatments in terms of events in the following way.

> Intuitively, the idea seems to be that [the standard donkey sentence (19) above] is true just in case every man for whom there is a donkey for which there is an event that consists in that man buying that donkey is such that there is some other event that consists in that same man [beating] the donkey he bought in the previous event . Such an analysis is supposed to be immune to the original objection concerning uniqueness because now uniqueness is relativized to events.(Neale 1990, p. 244)

Implementations of this alternative, for instance by Heim (1990) or Berman (1987), have displayed an interesting explanatory power in dealing successfully with, for instance, sage plant cases that Neale's proposal cannot handle.

Alternative (**b**) as a whole, however, has some serious flaws. We shall mention just two of them. The first problem is related to the idea of directly incorporating the uniqueness presupposition as a structural feature of the semantics of unbound anaphora expounded by Kadmon (1987, 1990). We have already suggested that the empirical motivations for

[32] See Heim (1990), Ludlow (1994), and especially Kadmon (1987, 1990)

that sort of semantic analysis are rather questionable. Most theorists working on the topic are inclined to agree with this conclusion. In particular, Kadmon's analysis cannot adequately handle sentences with existential readings like (58), or sentences with negative quantifiers[33] like '*no* farmer who owns a gun registers *it*', or complex cases of sage plant sentences like (59)[34] (see Rooth 1987, Heim 1990, Chierchia 1992, 1995, Kanazawa 1994). In all the cases above, intuitions of speakers count against interpreting donkey pronouns as implying uniqueness.

The second problem with alternative (**b**) relates to events and to an 'indirect' incorporation of uniqueness. If, as argued by Neale, we substitute for the numberless analysis an analysis endowed with E-type pronouns and quantification over events, presumably we will obtain for our standard example (19) (or (54)) something like the following structure (where '$\exists e$' is an existential quantifier ranging over events).

(***Qe***) [every x: man x &[an y: donkey y][$\exists e$](owns(x,y,e))] ([the y: donkey y & [$\exists e$] (owns(x,y,e))] [$\exists f$](beats(x,y,f)))

It is clear that (***Qe***) restores uniqueness by relativising the description of the pronouns to the events *e* and *f* of owning a donkey y by a man x and of beating that particular donkey by that particular man respectively. Unfortunately, structure (***Qe***) cannot represent sentence (19) adequately because the truth-conditions of both may differ. For instance, given a situation where there is a man *b* such that *b* bought two donkeys, (***Qe***) will be false whereas (19) can still be true. In Neale's words, in such a scenario "there is no unique donkey *c* for which there is an event in which *b* [owns] *c*" (Neale 1990, p.245). Thus, this event treatment is impotent to represent the plausible situation in which a man owns or buys more than one donkey simultaneously. The trouble, at least in part, with the description of events above is that it seems to require a one-to-one correspondence between the individuals connected by the *owning* relation. Although this requirement

[33] See next chapter for a formal definition of these quantifiers.

[34] However, Kadmon (1990, p. 316–9) shows how *simple* sage plant cases can be accommodated within a uniqueness setting.

obviously secures uniqueness of the object denoted by the NP *a donkey*, it clearly limits the explanatory power of the resulting theory.

There exists, nonetheless, an alternative available to event-theorists which handles the problem of matching the truth-conditions of (*Qe*) and (19). The suggestion, made mainly by Heim (1990) and Ludlow (1994), is to introduce ***minimal situations***—or minimal events—which the quantifier ranges over. The treatment of sentences such as (19) proceeds then according to the following steps: (a) we associate a kind of conditional force with donkey sentences, (b) we permit the introduction of an implicit universal quantifier over minimal situations, and (c) we spell the pronoun out as a definite description. We obtain thus the following structure for (19):

(***Qe'***) [every x: man x] [All s] [an y: donkey y](owns(x,y,s)
([the y: donkey y & owns(x,y,s)][$\exists s' \leq s$](beats(x,y,s')))[35]

(***Qe'***) says that for every minimal situation s in which a man owns a donkey, there is another situation s' ***related to s***[36] in which the man beats the donkey in s'. (***Qe'***) allows that a man owns more than one donkey as it does not dismiss multiple minimal situations describing the owning by the same man of a donkey. As a result, the truth of (***Qe'***) no longer requires the existence of a unique donkey owned by a man. Instead, it requires the existence of a unique donkey owned by a man ***in the minimal situation s***[37]. Indeed, we can accept that a donkey pronoun describes sets of such minimal situations, where each minimal situation is identified as the one containing a unique pair <*a*, *b*> such that *a* is a man and *b* a donkey that *a* owns. Therefore, the description remains semantically singular and its uniqueness presupposition untouched. Finally, it should be noticed that,

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[35] (***Qe'***) is taken from Ludlow (1994, p.173).This formula combines restricted quantifier notation and 'binary' quantifiers of the form '[All x] (Φ ,Ψ)'. Heim's (1990) notation is set-theoretical. There, the description *the F* is substituted by a partial function *f* which is made salient by the context.

[36] This is a loose way of interpreting the expression '$\leq$'; however, see chapter six, section 6.2 for a formal definition

[37] See Larson and Segal (1995, p. 407) for more detail.

from an ontological viewpoint, the previous result is a consequence of two assumptions: (1) the commitment to individual objects (the members of the pair <*a*, *b*>) underlying the analysis, and (2) its commitment to minimal situations and, crucially, to ***sets*** of situations composed, in their turn, of minimal situations or subsituations.

We believe the above alternative will not do either, not at least given the premises on which it is constructed. Our conviction is based on at least two related reasons. First, from an empirical point of view, as we shall show in chapter five, the minimal situation account does not provide an adequate treatment for other sorts of donkey sentences, in particular, complex sage plant sentences. Second, from a more speculative point of view, the philosophical recourse to subsituations or subevents is quite unilluminating when applied to donkey anaphora and clearly questionable when we want to analyse donkey sentences involving collective NPs in object position. We will examine a typical defense of this sort of minimal event account offered by Ludlow (1994).

Ludlow maintains a minimal event analysis applicable to simple sage plant sentences like the one in (63) above. The example that Ludlow uses in order to support his account is the conditional sentence 'if a man buys a plant he buys nine others along with *it*'. By putting technicalities aside, the resulting reading that the minimal event analysis provides is that in (***Qe''***).

(***Qe''***) All (minimal) events *e* of buying of a plant by a man are related to (or included in) an event *(non-minimal) e'* of 'buying of that plant plus nine others'.[38]

Ludlow recognizes that (***Qe''***) could be rejected on the basis that my buying of ten plants does not necessarily imply ten subevents or subsituations in which I buy the plants individually. For there are cases where plants come in ten-packs (or donkeys in *n*-herds,

[38] In Ludlow's notation, (*Qe''*) corresponds to the formula (i) below (e^* denotes a non-minimal event).

(i) [All e^*] [[an x: man x & [an y: plant y] (buy(x,y,e^*))] $\Rightarrow$ [the y: man x & [an y: plant y] (buy(x,y, e^*))] ([nine z: plant z & [the y : plant y & buy(x,y,e^*)] & y$\neq$z] ($\exists e' \leq e^*$)(buy(x,y,e')))]

for that matter) and cannot be purchased individually. He then argues in the following way:

> Even in this case, however, I think it is clear that there are
> (at least) ten sub-events in which the individual plants are
> purchased. Had nine of the plants later died and a friend
> asked when and where I bought the surviving plant,
> I would surely not hesitate to answer. I would answer
> by saying when and where I bought the plant. I surely
> would not say that I did not buy it, but that I bought a
> ten-pack and the surviving plant is part of what I bought.
> (Ludlow 1994, p.169)

It is worthwhile to clarify the scope of the philosophical implications behind Ludlow's argument. He introduces an atomistic refinement of our ontology of events which affects all object–position NPs of sentences with transitive verbs like *buy, sell, own, interplay* and, presumably, perception verbs like *see, listen*, etc. Since such verbs can take count nouns, mass terms and collections or groups indifferently as their object NPs, this refinement, in principle, should embrace all of them. Thus, quantification over events involving such verbs will involve quantification over subevents, with a cardinality (if any) determined by the atoms constituting the object NP. In other words, the ontology of events of speakers will be, in such contexts, richer and more productive than usually thought. We believe both friends and enemies of philosophical parsimony would agree that such an ontological claim needs to be substantiated by an extensive and detailed argument. In our opinion, Ludlow provides nothing like that.

However the evaluation of the aforementioned ontological claims may be, we think that the semantic side of Ludlow's argument can be resisted. The most important reason for this resistance is related to collections or pluralities. In the first place, Ludlow's ontological refinement creates in our semantics the necessity of artificially distinguishing between senses of 'belonging to a plural entity'. Pieces of jigsaws or chessmen are parts of sets in the same basic sense as sage plants may be of sage plant ten-packs. However, we would not like to say that buying a chess set involves 32 buyings. And, indeed, it is highly doubtful that after losing 31 pieces of a chess set a speaker would reply to the question imagined by Ludlow by saying 'Yes, I bought ***this*** pawn in Oxford Street five years ago' or 'Yes, my grandfather gave me ***this*** bishop thirty years ago'. Presumably, contra Ludlow's intuitions, speakers would reply by saying something like 'No, I did not buy ***this*** piece. I bought the entire set long ago'. In the second place, and related to the previous point, it is difficult to see how Ludlow's theory can handle some implications that the subevent semantics creates for expressions like *a heap of* or *a collection of*. Again, the selling of a collection of a thousand stamps or the buying of a heap of rice grains seems to hardly imply commitments to the existence of a thousand or an undefined number of subevents. If this is nonsensical, where and how then are we to draw the line between proper and improper subevents when talking about collections or groups? Finally, in order to draw that line we think that an additional definition of 'minimality' should be specified. However, if the criterion of minimality cannot depend on the raw cardinality of the particular objects involved in the description of the complex event, then it is difficult to conceive of a univocal criterion. For complex events can be diversely specified. For instance, the buying by a man of 100 sheep can be the selling by another man of two herds of 50 sheep.

Undoubtedly, the discussion above does not show that event or situation treatments of unbound anaphora are theoretically impossible. We believe, however, that it does show that the plausibility of those treatments relies largely on removing or relaxing therein the uniqueness constraint in some consistent and systematic way.

Alternative (**c**) implies finally two possible stances. The first one is to endorse a *partial* modification of Neale's conception of definite description in D-type pronouns, according to which such descriptions are better represented in certain contexts by non-Russellian mechanisms, that is, by *referential* ones. The treatment of definite descriptions as referential *within* a strict theory of E-type or D-type anaphora has been proven feasible by, among others, Lappin (1989), Gawron, Nerbonne and Peters (1991), van der Does

(1994), and Lappin and Francez (1994). Although evidently this option introduces a certain philosophical distance between the aforementioned proposals and Neale's, we think that this partial modification keeps the spirit of the D-type proposal. We will argue in that direction in chapters five and six. Since the pragmatical assumptions in Neale's theory are mainly motivated by Grice's views, they allow an important interaction between contextual information and background assumptions when dealing with anaphora across discourse.[39] Now, most current theories about background information processing are heavily based on work by Stalnaker (1972, 1974, 1978, among others). We believe that, in the context of a partially modified D-type theory,[40] Stalnakerian principles offer interesting prospects of extension to intersentential anaphora. We enlarge on this line of argument in chapter six.

The second stance is a radical one. It implies the complete abandonment of any E- or D-type analysis of donkey anaphora and the acceptance of an essentially different proposal. However, such a proposal, we believe, should satisfy two requirements in order to be accepted: (i) it should show that any unbound anaphora analysis within the D-type setting persistently fails to offer a systematic solution to those problems posed by sentences like (58)-(60) above; (ii) it should offer systematic and general solutions for such cases. So far, there are no proposals satisfying both requirements.

Thus, we believe that there are sound grounds to reject options (**b**) and the radical stance of option (**c**). That is to say, there are compelling reasons to reject treatments of donkey

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[39] See Neale (1990, p. 184 and p. 261, n.41.)

[40] Within Neale's Russellian D-type theory, an important clash between Stalnakerian and Gricean principles can be expected. This clash comes natural given, on the one hand, the acceptance, in Stalnaker's theory, of notions such as 'pragmatic presupposition' and, on the other hand, the rejection, in Neale's theory, of the Strawsonian account of presupposition and its replacement, as we saw in chapter two, with Gricean notions such as 'proposition expressed', 'proposition meant' and 'proposition conversationally implicated'. As it may be recalled from that chapter, with the latter notions, Neale handles the referential challenge that object-dependent propositions pose to Russell's theory of definite descriptions (see chapter two, section 2.1.3). However, in a ***modified*** D-type theory, where we accept that donkey pronouns can be interpreted as ***referential*** definite descriptions, the whole problem of object-dependent propositions vanishes, whatever the philosophical evaluation of this move.

anaphora relying on uniqueness presuppositions and/or on non-E-type pronouns. Moreover, we believe that a referential treatment of unbound pronouns is compatible with Neale's D-type theory and, therefore, attractive from an explanatory viewpoint. Finally, although we accept option (**a**), that is, we accept that 'honouring' Geachian truth-conditions is a theoretically incorrect goal, we think that there is no need to appeal to semantic ambiguity in order to save the non-univocality of donkey sentences. Demonstration of this depends heavily on making a case against theories or proposals positing a semantic ambiguity within donkey sentences. The last is the main objective of the following chapter.

CHAPTER IV

AMBIGUITY, NONSPECIFICITY AND DONKEY ANAPHORA

In this chapter we set out the motivations for an analysis of donkey anaphora in terms of nonspecificity. In the first place, we shall argue that the natural alternative to that analysis, a treatment of donkey sentences as expressing semantic ambiguity, is neither theoretically nor empirically cogent. In the second place, we shall suggest that the parametric and contextual factors associated with the processing of common nonspecific sentences play also a crucial part in the explanation and the processing of the different donkey sentence readings. This suggestion is reinforced by a striking parallelism between the way that some plural sentences receive different readings and the way that donkey sentences receive theirs. Finally, we claim that the formal attractiveness of the nonspecificity account stems from at least two characteristics. First, the nonspecificity account of donkey anaphora retains the guiding idea of the descriptive treatments of unbound anaphora according to which the explanation of the anaphoric relation lies in the pronoun rather than the antecedent. Second, a nonspecificity account allows us to depict the donkey pronoun as a device that, in accordance with pragmatic and contextual knowledge, incorporates parametric factors, which are responsible for the different readings that the pronoun gives rise to.

The chapter consists of four sections. In Section 1, we apply a standard ambiguity test to donkey sentences and conclude, from that application, that the prospects of classifying those sentences as ambiguous ones are rather poor. Despite this result, in Section 2 we insist with the hypothesis of ambiguity and explore possible internal-to the-sentence sources for it, in particular, indefinite determiners. In Section 3, given the poor prospects of a theory of ambiguity for donkey sentences, we opt for an analysis of donkey anaphora in terms of nonspecificity. In particular, we show how an analysis in terms of such notions as external meaning, referential nonspecificity and parameterization seems to satisfy most of our semantic and pragmatic intuitions about donkey anaphora. Finally, Section 4 recapitulates the main thread of concern examined throughout the chapter and makes an initial evaluation of the prospects of the nonspecificity account.

4.1 Donkey Anaphora and An Ambiguity Test

If we regard a donkey sentence as expressing semantic ambiguity we can evaluate the source of that ambiguity from at least two standpoints (obviously related if we assume compositionality): (a) from the standpoint of the sentence as a semantic whole, (b) from the standpoint of the internal composition of the sentence. In the latter case, as pointed out in Chapter Three, Section 3.2, the analysis will depend on which constituent of the sentence produces the ambiguity, the determiner or the pronoun. In this section we shall focus on examining ambiguity from the sentence stanpoint. This is followed in the next section by an examination of ambiguity from the internal composition stanpoint.

The discussion about non-univocality of donkey sentences originates from the fact that they can, in principle, receive two possible interpretations, the existential and the universal interpretation—henceforth, ***E-reading*** and ***U-reading*** respectively. The cumbersome expression 'donkey ambiguity' will help us to designate such a duality of readings.[1] Now, if questioned as to whether, given such interpretations, donkey sentences are semantically ambiguous or not, we can ask ourselves whether there is a way of

[1] This convention, however, cannot apply to our discussion in the following chapters, where we examine other kinds of readings generated by donkey sentences.

definitively testing this fact before giving an answer. In other words, we can ask whether there is a semantic means of establishing that the duality E-reading/U-reading is a manifestation of ambiguity and not of, for example, nonspecificity, vagueness or other similar phenomena. A test that seems to provide such a means is the one formulated by Quine (1960)—henceforth QT. Before applying that test to the problem of donkey anaphora, it is worth noticing that QT, as any other test of that sort, cannot be considered as being able to implement the necessary conditions for a non-univocal sentence to be qualified as ambiguous.[2] At best, it provides reasonable criteria that match most of our semantic intuitions about ambiguity. Therefore, we can take its results, when they do not conflict sharply with those intuitions, to be reliable enough to suggest presence or absence of ambiguity, but nothing else. QT—an extensional test of ambiguity—can be schematically stated as follows.[3]

(QT) A sentence is ambiguous iff, with respect to a given state of affairs, the sentence can be both truly affirmed and truly denied.

Applied to the paradigm donkey sentence, repeated as (1) below, QT should tell us, in a situation *A* where we truly affirm the sentence (namely, the state of affairs determined by the U-reading of (1)) whether we are equally entitled to truly deny the sentence, and

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[2] The limitations of the ambiguity tests have been classicaly examined in Zwicky and Sadock (1975). The most important upshot of their paper is that, where there is a relation of (proper) inclusion between the two (or more) intended interpretations or readings of a sentence, the sentence will count as non-ambiguous (see Zwicky and Sadock 1975, pp.23-4). So, non-univocal sentences containing words commonly considered ambiguous like, for instance, *a dog* will qualify always as nonspecific, due to the fact that one of the senses of the word is included in the other (in this particular case, the sense 'male dog' in the generic sense unspecified for sex). Although Zwicky and Sadock's conclusions are intended to apply to lexical cases of ambiguity considered by Lakoff (1970), they can be extended to other more conspicuous cases, in particular, scope ambiguity caused by the interaction of two quantified NPs. Thus, Zwicky and Sadock's results throw also doubts about the nature of certain cases of structural or sentential ambiguity (see Kempson 1977, pp. 136-7). For more discussion on ambiguity tests see Kooij (1971), Atlas (1977, 1989), Lyons (1977), Kempson and Cormack (1982) and Roberts (1987).

[3] QT was originally intended to apply to just lexical items (see Quine 1960, p.121 and p.131). However, extension to sentences is obvious. For discussion see Atlas (1989) and for an application to plural sentences see Gillon (1987).

therefore to get its E-reading.[4]

(1) Every man who owns [a donkey]$_1$ beats *it*$_1$.

Let us imagine that *A* represents a model in which the following conditions hold: two men, Joe and Jim, own a total of three donkeys; Joe owns Toffee and Jim owns Blackie and Spot. In addition, in *A* Joe beats Toffee and Jim beats Blackie and Spot. Given these conditions, that is to say, given a model or situation in which all donkeys are beaten by their owners, we are entitled to truly affirm (1) as implying the reading in (2) below.

(2) Every man who owns a donkey beats all donkeys he owns.

However, clearly *A* does not entitle us to truly deny (1), i. e., to utter the sentence (3), which is equivalent (in the proposed situation) to the E-reading in (4).

(3) Every man who owns a donkey does not beat ***all*** donkeys he owns.
(4) Every man who owns a donkey beats ***some*** donkeys he owns.

We can consider a new situation *B* with identical conditions as *A* except that, for example, Jim does not beat Spot. In that case, interpreters (in normal circumstances) will take it that (1) is false, that is, they will be entitled to truly deny (1). Then both (3) and (4) will be true but indeed (2) will not. And, as a result, we are not entitled to truly deny and affirm (1) in the same situation or state of affairs.

The same argument seems to apply to those sentences like (5) below, whose preferred reading is the existential one.

(5) Every man who has [a credit card]$_1$ pays his bill with *it*$_1$.

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[4] We assume that, as a matter of fact, the domain of the entities denoted by the quantified NPs of the donkey sentences is nonempty.

Let us suppose a model or situation *C* where John and Joe have in total four credit cards, namely, John has a Master one and a Gold one, and Joe has a Visa one and a Silver one, and John pays his gas bill with the Master card and Joe his phone bill with the Silver card. Thus, given situation *C*, (5) will be truly affirmed on the E-reading, that is, on the reading in (6) below.

(6) Every man who has a credit card pays his bill with ***one*** (of the) card(s) he has.

Clearly, given *C*, we are not entitled to truly deny (5) and, thereby, utter the sentence (7)—the negation of the E-reading, which is equivalent (in the proposed situation) to the U-reading stated in (8).

(7) Every man who has a credit card does not pay his bill with *one* of the cards he has.
(8) Every man who has a credit card pays his bill with *all* credit cards he has.

This, we believe, shows us that we are not entitled to truly affirm and deny sentence (5) in the same situation or state of affairs. Thus, application of extensional tests of ambiguity such as QT or similar ones apparently dictates that donkey sentences cannot be ambiguous. However plausible such a conclusion may sound, it might be resisted because of two reasons, present already in our discussion. On the one hand, (and as indicated in footnote 2) no test of that sort can be taken as specifying necessary (and sufficient) conditions for determining ambiguity. On the other hand, QT is weakly sensitive to the internal structure of the sentence. That is, it does not provide any suggestion concerning particular constituents of the sentence in question. These reasons suggest that, before drawing any definitive conclusion, we must explore whether other internal constituents of the sentence in question can be the hidden source of the purported ambiguity.

4.2 Ambiguity of Determiners or Ambiguity of Pronouns?

4.2.1 Rooth's account

A first and obvious alternative when examining ambiguity in the internal structure of donkey sentences is to look at indefinites. That is to say, we may consider the indefinite determiner *a* within the restriction of the phrase *every F* in those sentences as a constituent lexically ambiguous between an U-reading and an E-reading. In the U-reading case, the indefinite determiner should be interpreted in the same way as the determiner *any* is. But this proposal must be quickly rejected on the basis of well-established evidence.[5] For example, sentences like (9) and (10) below leave no room for universal readings of their indefinites.[6] Consequently, (9) and (10) accept just E-readings.

(9) *A* man from Manchester came to see me this morning.
(10) My wife read *a* novel last night.

Since the theory of full-blown ambiguity of the indefinite collapses immediately due to its being 'too coarse', a more fine-grained analysis of the donkey constituents seems to be called for, if we are to stick to the idea of an ambiguity internal to donkey sentences. An example of a more sophisticated ambiguity approach is Rooth (1987). Rooth proposes that the apparent universal force of the indefinite (the U-reading) in donkey sentences be explained in terms of the quantificational determiners that are adjoined to the head of the QNP containing the indefinite in the restrictive clause. According to Rooth, it is necessary to draw a finer distinction in donkey sentences between the head of the QNPs (for example, *man who owns...* or *donkey which is owned...*) and the indefinite NPs in the restrictive clause of that QNP (for example, *a donkey* in *who owns a donkey*, or *a*

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[5] 'Generic' uses, as in (i) below, are usually the source for wrongly claiming a full-blown ambiguity of the indefinite. In fact, the genericity of (i) is a property of the whole sentence (or clause) rather than of the determiner or NP; see Pelletier and Asher (1997).

(i) A philosopher must know logic.

[6] See Neale (1990) and Hintikka and Carlson (1978).

man in *which is owned by a man*).[7] Rooth justifies that distinction by reflecting on the relation between the FOC structure (11) below and the paradigm donkey sentence.

(11) $(\forall x)(\forall y)$ [[man (x) & donkey (y) & own(x,y)] $\rightarrow$ beat(x,y)]

He then argues as follows:

> [S]uppose we agree that [(11)] entails[(a) below]. This tells us nothing about models, [...], where some man beats some but not all of the donkeys he owns. Specifically, suppose John owns ten donkeys and beats exactly nine of them, and that every other man beats every donkey he owns. Then is [(a)] true?
> [(a)] Every man who owns a donkey beats it
> [(b)] Every donkey which is owned by a man is beaten by him.
> Informants have given me varied and guarded judgements about this case. What everyone agrees however is that [(b)] is false under these circumstances. What is the explanation for the difference in intuitions if [(a)] and [(b)] have the same interpretation [...]? (Rooth 1987, pp. 253-4)

Rooth also contends to the extent that the analysis of *every* and *a donkey* in [(a)] and [(b)] is "extended to other determiners, similar problems arise". That is to say, hearers should interpret sentences (13) and (15) below differently from their standard counterparts, namely, (12) and (14).[8]

(12) Most men who own *a* donkey beat *it*.

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[7] See Rooth (1987, p.254).

[8] Rooth is here reacting to certain theories of donkey anaphora (for example, Kamp 1981 and Heim 1982) that seem to imply that these pairs of sentences are semantically equivalent by relying on the apparent equivalence of [(a)] and [(b)] above. However, it is clear that such an equivalence could not be held for the pairs (12)-(13) and (14)-(15) below. Thus, let us suppose a situation with a hundred farmers, ninety-nine of whom own exactly one donkey, and one of whom owns a thousand donkeys. Now suppose further that the latter farmer beats all of his donkeys whereas none of the other donkeys are beaten. In that situation, sentences (12) and (14) are false while (13) and (15) are true. See Rooth (1987, p. 254) and Kanazawa (1994, p.115–6).

(13) Most donkeys owned by *a* man are beaten by *him.*
(14) Many a man who owns *a* donkey beats *it.*
(15) Many a donkey owned by *a* man is beaten by *him.*

Therefore, Rooth concludes, these data "motivate a semantic distinction between the head of the quantified NP and indefinite NPs in donkey sentences" (Rooth, op.cit. p.254). In particular, according to Rooth, when *monotone increasing* determiners[9] (quantifiers like *every,* or *most*) appear adjoined to the original head of the QNPs that contain the indefinite determiner—as in donkey sentences [(a)], (12) and (14), a duality or ambiguity of readings of the indefinites seems available. The two readings are the E-reading when the indefinite is interpreted within the restrictive clause of the QNP and the U-reading when the indefinite is interpreted independently on the head of the quantified NPs. For instance, the U-readings generated for the indefinites of sentences [(a)] and (12) may be exemplified respectively by the sentences (16) and (17) below.[10]

(16) For <u>every</u> x such that x is a man who owns a donkey_2, for <u>every</u> donkey which is owned by x, x beats it_2.

(17) For <u>most</u> x such that x is a man who owns a donkey_2, for <u>every</u> donkey which is

[9] 'Being monotone increasing' is an instance of a quite general property of determiners, namely, their having 'directional entailingness' (Ladusaw 1979). This general property can be spelt out as the capacity of the determiner of preserving entailment from a more (or less) restrictive term to another less (or more) restrictive terms. This property and others have been extensively studied by, among others, Barwise and Cooper (1981) and Higginbotham and May (1981). Nontechnical definitions for monotone increasing and decreasing determiners can be formulated as follows: given a determiner D, and predicate formulae $\Phi$and Ψ, (a) D is a monotone ***increasing*** determiner iff '(Dx)(Φx)' and '($\forall$x)(Φx $\rightarrow$ Ψx)' imply '(Dx)(Ψx)'; and (b) D is a monotone ***decreasing*** determiner iff '(Dx)(Φx)' and '($\forall$x)(Ψx $\rightarrow$ Φx)' imply '(Dx)(Ψx)'; D is non-monotone iff it is neither monotone-increasing nor monotone-decreasing. We can also give definitions of monotonicity for restricted quantifiers. In such a case, the scope of the determiner will have to be systematically introduced. For example, the following will be the (nontechnical) definition of a restricted monotone increasing determiner: D is a monotone increasing determiner iff '[Dx:Φx](Ψx)' and '[every x: Ψx](Γx)' imply '[Dx:Φx](Γx)'. In systematically introducing restrictions and scopes, attribution of the property of monotonicity to determiners will involve their scope as well. In such a case, a determiner can, for example, be monotone increasing in the restriction (or 'left' monotone increasing) but monotone decreasing in the scope (or 'right' monotone decreasing). Finally, given the above definitions, natural language determiners like 'every F', 'some Fs', 'most Fs', and 'the F' will qualify as monotone increasing whereas quantifiers like 'few Fs', 'exactly n Fs', 'no Fs' and 'just one F' will not. It is worth noting that all of these definitions can be formulated and studied within a strictly set-theoretical conception of quantifiers; for details see Barwise and Cooper (1981), van Benthem (1983) and Larson and Segal (1995).

[10] A similar proposal is stated in Root (1986). See Chierchia (1995) for other details.

owned by x, x beats it_2.

As Chierchia (1995, p. 111) explains, the first underlined component in (16) and (17) binds the variable supplied by the head of the NP. In his words, the quantificational force of the latter depends on the lexical meaning of the determiner. In contrast, the second underlined component is fixed for every determiner and binds universally the indefinites in the restriction.

As Chierchia notices, Rooth's proposal can be implemented within a dynamic approach. In order to do so, we need to modify the definition of the conditional underlying the *every* determiner. The idea will be that ***every*** way of verifying the antecedent leads to a verification of the consequent. In other words, we need something like the definition of the *every* determiner in (18) below. Therein the expression '$\underline{\rightarrow}$' stands for a non-classical conditional, which depends on verification conditions. Also, as indicated by Chierchia, since (18) is equivalent to '$[\underline{\exists}x\Phi] \underline{\rightarrow}_{\forall}(\Psi)$' (where Ψ contains no free occurrences of 'x'), we can *mutatis mutandis* obtain, from the dynamic E-reading of a donkey sentence in (19), the U-reading in (19') (which is the version of (11) above).

(18) $(\underline{\forall}x)[\ \Phi \underline{\rightarrow}_{\forall} \Psi]$.[11]
(19) $(\underline{\forall}x)\{[\text{man}(x)\ \&\ (\exists y)[\ \text{donkey}(y)\ \&\ \text{own}(x,y)\ ]] \underline{\rightarrow}_{\forall} [\ \text{beat}(x,y)]\}$
(19') $(\underline{\forall}x)(\underline{\forall}y)[[\ \text{man}(x)\ \&\ \text{donkey}(y)\ \&\ \text{own}(x,y)] \underline{\rightarrow}_{\forall} [\ \text{beat}(x,y)]\}$

Rooth's proposal, in our opinion, has two advantages in comparison with the full-blown theory of lexical ambiguity: firstly, it is an improvement because it dismisses the indefinites as a lexical source of the ambiguity of donkey sentences. According to Rooth,

[11] Rooth's definitions of determiners involve *generalized quantifiers*. That is, quantifiers denoting relations between sets (see Chapter Five for a more detailed explanation). In turn, the sets related are, in Rooth's theory, parameterized sets (in the sense of Barwise and Perry 1983). Rooth's formulation of the definition of *every* is the following:

$\|every\| = \{\langle g,P,Q,h\rangle \mid g=h\ \&\ P\subseteq Q\ \}$ (where g and h are assignments and P and Q range over parameterized sets) it is the monotone increasing determiners, interacting with internal-to-the-QNP configurations, that determine the different readings of the indefinites. Secondly, it assumes that ***every*** donkey sentence will generate two readings, namely, the E- and the U-reading respectively. That is to say, it assumes tacitly that, quite apart from the contextual factors selecting a particular reading, the ambiguity is a ***systematic*** phenomenon affecting each sentence in virtue of its determiners.

Despite these improvements, however, the proposal is defective on several counts. Its main defect is that the shift from the indefinites to other determiners, in order to accommodate the ambiguity, does not add anything in terms of adequacy and simplicity to the semantics thus constructed. A first general criticism put forward by Chierchia (1995) is that the general availability of both the U-reading and the E-reading seems extremely doubtful. The point is that if the availability of the readings depends on genuine and definite ambiguity, there should be languages where such an ambiguity is resolved. In Chierchia's words, one would expect to find languages where "the *every* which has the [E-]readings and the one which has the [U-]readings are realized as different words or morphemes" (Chierchia 1995, p.112). And so far we know of no language bearing such a difference. The following remark from linguists working on ambiguity issues brings out the point made by Chierchia.

> If a distinction in [readings] is a systematic ambiguity in some language , then that distinction is potentially realizable by a formal mark in some other language; conversely, a distinction not formally realizable is either a systematic lack of specification or an unsystematic ambiguity . (Zwicky and Sadock 1975, p.5)

A second and more important criciticism concerns the nature of the E-reading that Rooth's treatment assigns to donkey sentences. In our opinion, it is questionable that such a reading allows us to attribute any genuinely existential interpretation to donkey pronouns. As far as we can see, Rooth's treatment compels us to understand in the universal sense those pronouns because their interpretation depends on the monotone increasing determiners associated with the head. This can be seen by checking the consequences that follow from definition (18) when we consider donkey sentences—for example, sentence (5) above—where the E-reading is the preferred one. In such an E-reading, the existential import of the indefinite in the relative clause is completely transferred to the donkey pronoun in the matrix VP. That is to say, (5) can be understood as 'every person who has a credit card pays his/her bill with *some* (or *one*) *of the* credit cards he/she has'. Rooth's proposal does not enable us to capture this reading as a genuine and independent interpretation of the sentence in question. For, given the equivalence between '$\underline{\forall}\, x\, [\Phi \underline{\rightarrow}_{\forall} \Psi]$' and '$[\underline{\exists}\, x\Phi] \underline{\rightarrow}_{\forall} (\Psi)$', it follows that the donkey pronoun can always be understood universally, that is, as in sentence (16). Accordingly, it seems hard to see how preferred E-readings of donkey sentences can be obtained in this approach as genuine and independent readings.

Finally, a semantics that permits ambiguities of determiners of the sort suggested by Rooth is bound to face problems of simplicity and generality. For, in order to obtain the relevant readings, this semantics must modify standard definitions of some quantifiers. The problem in this case is that those modifications can, in their turn, affect general properties of the quantifiers in question in certain circumstances. Thus, as pointed out by Chierchia,[12] Rooth's definition will affect the ***dynamic conservativity*** of the monotone increasing determiners, i.e. the dynamic version of an apparently universal property of such determiners.[13] According to Chierchia, any determiner with the structure of (16) or

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[12] See Chierchia (1995, p.112).

[13] Conservativity is a determiner relation holding between two sets X, Y just in case it holds between the first and the intersection of the first with the second. Formally speaking, a determiner D is conservative if for all X,Y and all M such that X, Y⊆M, D(X)(Y) iff D(X)(X∩Y) (see Westerståhl 1989). Another alternative definition given by Keenan and Stavi (1986) is the following: a function *f* is conservative iff for all properties P, Q, P∈*f*(Q) iff (P∧Q)∈*f*(Q). The following equivalences illustrate some natural language conservative determiners:

(a) Many musicians run ⇔Many musicians are musicians who run
(b) Few poltiicians snore ⇔Few politicians are politicians who snore
(c) Jim meets Wilfredo ⇔Jim is Jim and meets Wilfredo.

Non-conservative quantified phrases are, given the above definition, *all but*, *everyone except* or *only* (see Larson and Segal 1995, ch. 8). Since conservativity is perhaps the most general property characterizing ***all***

(17) turns out not to be dynamically conservative. Technicalities aside, this has immediate consequences in interpreting sentences like (5) above. In Chierchia's words, "if [....] we analyze *every* as in [(16) or (17)], it is clear that 'Every person who has a dime will put it in the meter' does not come out equivalent to 'Every person who has a dime is a person who has a dime and puts it in the meter', for the former entails that every dime owned by everyone is put in the meter, while the latter does not" (Chierchia 1995, p.112).[14] Thus, Rooth's definitions seem to threaten the general adequacy of a semantic treatment of unbound anaphora.

The results of the application of QT and the failure of both the theory of full-blown ambiguity of the indefinites and Rooth's theory of ambiguity of determiners lead us to conclude that the analysis of donkey anaphora in terms of ambiguity discussed above is unattractive. That might also lead one to the rather hasty conclusion that any other ambiguity account of donkey anaphora will be unattractive because of its sharing all or some premises behind the previous analysis. Nevertheless, there is at least one theory of donkey ambiguity that clearly escapes this last conclusion. Therefore, we must examine this theory before taking a general stand on the donkey ambiguity hypothesis.

4.2.2 *Chierchia's dynamic solution*

The theory in question has been defended by Chierchia (1992, 1995). It offers an interesting solution which retains the ambiguity analysis without positing any internal source of the ambiguity in question. According to Chierchia, there is no necessity to posit a lexical ambiguity in the determiners since donkey pronouns "have no inherent semantic content" (Chierchia 1995, p. 113). He claims that, in analogy with variables in FOC, donkey pronouns have free and bound uses and that these uses do not depend on

human language determiners, Barwise and Cooper assume that such a property is "the only genuinely logical constraint" to be imposed on them. For other properties and theorems see Barwise and Cooper (1981) and Keenan and Stavi (1986). For discussion and some alleged counterexamples see Keenan (1996).

[14] Also Chierchia rejects on simplicity grounds other dynamic definitions of conservativity suitable to determiners with U-readings.

any structural feature internal to the pronouns or the determiners. As a result, the crucial question for Chierchia is how to provide the content for donkey pronouns. In a few words, his general answer goes as follows: we must provide the content by relying on LF semantics—semantics of binding—and pragmatics—the E-type strategy. The following is his own formulation of the point.

> [The] content [of donkey pronouns] is provided in essentially two ways : via semantic binding (in the appropriate configurations) or via contextually available information. The E-type strategy, I believe, is part of the second way of individuating the content of the pronouns; it is a strategy to retrieve through the context the value of unbound pronouns. More specifically, the linguistic and extralinguistic context can supply descriptions which can be exploited to reconstruct the intended value of a pronoun. (Chierchia 1995, p.113)

Before examining Chierchia's version of E-readings, we must clarify the main assumptions behind his line of reasoning. Chierchia uses a dynamic approach to semantics, that follows to certain extent Groenendijk and Stockhof (1990). This approach incorporates the idea that interpretation of sentences in discourse is sensitive to ***context change***. Chierchia clarifies this view by saying "sentences introduce new discourse referents and deactivate old ones, thereby constraining the way discourse unfolds" (Chierchia op. cit., p. 81). Using Chierchia's approach, we can translate a natural language sentence S into a formal language sentence S'[15] to form a formula [S' $\wedge$ p]. The latter formula conjoins S' with a propositional variable which can be filled "by adding information to S in any possible way". Consequently, 'p' can be seen as a hook onto which incoming information can be hung. Chierchia concludes that [S' $\wedge$ p] can be interpreted as "a representation of the options one has available as a consequence of uttering S in the initial context—that is, as the ***context change potential*** of S" (Chierchia op. cit. p. 81; my emphasis). This allows Chierchia to interpret sentences like 'a woman sings' by means of the formula '$\underline{\exists x\ [\text{woman}\ (x) \wedge \text{sings}\ (x)}\ \wedge p]$', where the underlined portion is the formal

[15] Chierchia uses a version of Montague's Intentional Logic (IL); see Chierchia op.cit. p. 78.

translation of 'a woman sings' while 'p' works as the variable over possible continuations according to the model of context change potentials. Also, the scope of the existential quantifier includes 'p'. Thus, it is possible now to interpret a possible continuation of the previous sentence like 'she was pretty' by means of the formula '$\exists x$ [woman (x) $\wedge$ sings (x) $\wedge$ pretty (x) $\wedge$ p]'. And by composing the latter formula in analogy with the former one, the variable corresponding to the pronoun *she* winds up being bound by '$\exists x$' (which corresponds to the NP *a woman* in the initial sentence), despite the fact that the pronoun is not within the ***syntactic*** scope of the NP. So, Chierchia suggests that the value of sentences be (compositionally) calculated in terms of context change potentials instead of truth-conditions. Chierchia proposes to formalize this semantics of context change potentials in accordance with the following constraints: the context change potential of a standard formula ϕ can be represented by means of a λ-expression, i.e. $\lambda p[\phi \wedge {}^{\vee}p]$, which in turn Chierchia abbreviates by means of '$\uparrow\phi$'. The 'up-arrow' works as "an operator mapping the ordinary, static value of a formula into the coresponding context change potential". Thus, the sentence '*he* sings', statically translated by 'sing (x_i)' ('x_i' represents a 'discourse marker'), can be dynamically translated by '$\uparrow$ sing (x_i)', which is equivalent to '$\lambda p[\text{sing}(x_i) \wedge {}^{\vee}p]$'. Finally, Chierchia builds up the logic underlying his dynamic semantics by means of non-standard dynamic definitions of logical operations. Those definitions, formulated in terms of context change potentials, are as follows:

(i) $A \underline{\wedge} B = \lambda p[A(^{\wedge}B(p))]$
(ii) $\underline{\neg}A = \uparrow\neg\downarrow A$
(iii) $A \underline{\vee} B = \underline{\neg}[\underline{\neg}A \underline{\wedge} \underline{\neg}B]$
(iv) $A \underline{\rightarrow} B = \underline{\neg}A \underline{\vee} [A \underline{\wedge} B]$
(v) $\underline{\exists}xA = \lambda p\exists x\,[A(p)]$
(vi) $\underline{\forall}xA = \underline{\neg}\,\underline{\exists}x\,\underline{\neg}A$

Thus, if 'C' is a standard logical connective or quantifier, '$\underline{C}$' is its (non-standard) dynamic counterpart as defined over context change potentials.

The foregoing enable us to specify how Chierchia obtains his version of the E-reading for the paradigm donkey sentence (1) above. Definitions (iv), (v) and (vi) are crucial here.

In particular, using a conjunction in (iv) has the effect that quantifiers active in the antecedent will be able to bind variables in the consequent.[16] So, the canonical translation of (1) into a dynamic language will be (20.a) below.

(20.a) $\underline{\forall}x[\lambda p\,[man(x) \wedge \exists y[\,donkey(y) \wedge owns(x,y) \wedge {}^{\vee}p]] \underline{\rightarrow} \lambda p[beat(x,y) \wedge {}^{\vee}p]]$

In (20.a) the antecedent corresponds to *man that owns a donkey* and the consequent to *beats it*. The variable (or discourse marker) corresponding to the pronoun is not in the scope of the quantifier corresponding to *a donkey*. By applying the dynamic definition of *every* in (18) above (20.a) can be interpreted as saying that for every x, either x is not a donkey-owning man or x is a man that has a donkey and beats it.[17] And use of dynamic conjunction in the consequent allows *a donkey* to semantically bind *it*, as (20.b) below makes it clear.

(20.b) $\uparrow\forall x[\,[man(x) \wedge \exists y[\,donkey(y) \wedge owns(x,y)]] \rightarrow \exists y[donkey(y) \wedge owns(x,y) \wedge beat(x,y)]]$[18]

In (20.b) the pronoun *it* is clearly bound in the consequent by the existential quantifier '$\exists y$'. Thus, (20.b) entails a (kind of) E-reading according to which, every man who owns a donkey beats at least one donkey that he owns. Also, as argued by Chierchia, interaction of the previous definitions of logical operators with the non-standard definition of dynamic conservativity given in (vii) below is enough to secure conservativity of the determiner *every* in examples like (5) above, where the E-reading is the preferred one.[19]

(vii) $\boldsymbol{Det}(P)(Q) \equiv \boldsymbol{Det}(P)(P\ \underline{\wedge}\ Q)$ [where P, Q are dynamic properties and $\underline{\wedge}$ is

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[16] Whereas truth-conditionally '$\neg A \vee B$' and '$\neg A \vee [\,A \wedge B]$' are equivalent, their dynamic counterparts are not.

[17] See Chierchia (op. cit. p. 92)

[18] See Chierchia (op. cit. p. 92)

[19] See Chierchia (op. cit. pp. 97-8 and pp.111-2)

a generalized dynamic conjunction]

Although Chierchia's U-reading coincide with the E-type reading with respect to the descriptive conception of the donkey pronoun, the former do not coincide with the latter with respect to the nature of the pronoun itself. Instead of conceiving donkey pronouns as going proxy for rigid designators (Evans) or quantifiers (Cooper, Neale), Chierchia, by following other theorists, contends that such pronouns go proxy for functions from individuals to individuals.[20] The function, according to Chierchia, is contextually specified so that "what governs the use of E-type pronouns is simply the fact that in certain contexts [...] functions from individuals into individuals become salient in the common ground and can be used in interpreting the pronouns" (Chierchia 1995, p.114). Moreover, this implies, technically speaking, that domains and ranges of such functions are contextually supplied. Thus, the U-reading of the sentence generated by Chierchia's functional strategy for sentence (1) above will be the one in (21).

(21) $\forall x[[\text{ man}(x) \;\&\; \exists y[\text{donkey}(y) \;\&\; \text{owns}(x,y)]] \rightarrow \text{beats}(x,f(x))]$
f: a function from men into the donkey (or donkeys) they own.

The function in (21) then picks out the individual or individuals in the range (i.e. donkeys owned by men in the domain) and allows us to describe them in the E-type way (i.e. as the donkey or donkeys owned by those men). Number-neutrality or numberless is secured, according to Chierchia, by the functional interpretation because "when pronouns are interpreted functionally, they seem to have a particular semantic property, namely that of being unmarked as to whether the value of the function is singular or plural" (Chierchia 1995, p.115). Since we shall discuss in detail the functional conceptions of donkey anaphora in Chapter Five, we will not deal here with other technical aspects of Chierchia's theory.

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[20] See Chierchia (op. cit., p. 116). In Chierchia (1992), this author assumed a slightly different functional conception, according to which U-readings are obtained from choice functions mapping individuals to one individual in the range (see Chapter Five). Nonetheless, Chierchia makes an explicit rejection of the choice function conception in Chierchia (1995), after some criticisms of it by Kanazawa (1994).

The results of Chierchia's account seem more satisfactory than those of the previous proposals. First of all, in his approach there is no lexical ambiguity at all. That is, the ambiguity does not involve any constituent (either determiners or pronouns) of the donkey sentence. Rather the ambiguity is to be located, if we understand Chierchia rightly, in the modules that the speaker appeals to in interpreting sentences—namely logic, semantics, and pragmatics—and in the different emphasis that the speaker put on each module when he uses the sentences in real communication. Accordingly, it seems fair to say that Chierchia's proposal entails that ambiguity of donkey sentences is an indirect phenomenon, namely a consequence of applying different methods in the course of processing donkey sentences by interpreters. Second, Chierchia's approach has greater explanatory power than Rooth's because the former generates the genuine E-reading of donkey sentences with monotone increasing determiners and, thereby, the preferred reading of sentences like (5) above. Third, Chierchia's nonstandard definitions of the determiners match the standard ones and, consequently, preserve, to a certain extent, all relevant universal properties of those determiners.

Despite all these positive aspects, Chierchia's proposal has several technical and methodological flaws that make it a hopeless solution. Most flaws have been singled out by Kanazawa (1994) and Lappin and Francez (1994). We shall consider here only the problems that Chierchia's theory raises at the methodological level.

As we saw, one of Chierchia's objections to Rooth's proposal is that the latter involves an undesirable loss of simplicity and, thereby, of adequacy. However, Chierchia's proposal is subject to the same criticism if identical standards of simplicity and adequacy are applied to it. Chierchia's solution introduces a complex methodological hiatus in the semantics for which no argument is provided. Such increase in complexity seems inevitable because the relevant anaphoric readings are going to be generated differently: the binding theory will be responsible for one type of representation—the E-reading with the bound interpretation of the pronoun—and the E-type strategy will be responsible for another completely different one—the U-reading with the unbound interpretation. Nevertheless, Chierchia produces no explanation to persuade us that this complexity describes a real dichotomy in the way that interpreters process anaphoric sentences bearing either E-readings or U-readings (or even both). The necessity of such an explanation is hardly trivial since, as pointed out by Lappin and Francez (1994, p. 400) "the pronouns in both sets of sentences appear to exhibit the same sort of anaphoric relation to their antecedents." The point can be expressed by the following question: Why should we assume that the readings in question express two different and incommensurable types of anaphora, when firm syntactic intuitions seem to indicate that the anaphoric relation is a uniform phenomenon? In fact, as Lappin and Francez argue, the apparent difference between Chierchia's readings seems to depend on "the strength of the description associated with the pronoun rather than on the nature of the connection between the pronoun and the indefinite NP which is its antecedent" (Lappin and Francez 1994, Ibid.). In one case, the U-reading, we get a definite description (of the value of the function) like *the F such that S* and, in the other case, the E-reading, we get an existential description like *at least one F such that S.* Differences between both types of descriptions seem thus to reduce to different logical conditions on the same anaphoric relation rather than to differences in the type of anaphora involved, as Chierchia wants us to believe.

A second weakness of Chierchia's approach, also suggested by Lappin and Francez, concerns the absence of some clear criterion of preference of readings for particular sentences. Apparently this defect is remedied in Chierchia (1995) by suggesting "salience in the common ground" as what selects the U-reading. However, as argued by Heim (1982), salience—although a desirable constraint in donkey anaphora theories—can hardly be the sole operative notion in donkey anaphora across discourse. In Chapter One, Section 1.3, we examined examples like the following, discussed by Heim:

(22) I dropped ten marbles and found them all except for *one*. *It* is probably under the sofa

(23)? I dropped ten marbles and found only nine of them. *It* is probably under the sofa.

(24) Jim owns *a donkey*. Mary beats *it*

(25) ? Jim is a donkey-owner. Mary beats *it*.

Heim argues that, e.g. in (24)–(25), since 'Jim owns a donkey' and 'Jim is a donkey-owner' are equivalent, an utterance of either sentence should make Jim's donkey (or donkeys) contextually salient. However, she contends, since the two occurrences of the pronoun *it* are not equally felicitous, we must conclude that "the salience-shifting potential of an utterance is not predictable from its truth-conditions and the surrounding circumstances alone" (Heim 1982, p.21). Since the pronouns in (22)–(23) and (24)–(25) must be interpreted by means of U-readings (e.g. as *the marble that I did not find* or *the donkey (or donkeys) Jim owns*), Heim's conclusion applies also to Chierchia's suggestion of using salience for establishing the anaphoric linkage. Thus, if the E-type strategy is available across discourse, this cannot only be the consequence of salience mechanisms. Besides, it is clear enough that salience (or other pragmatic mechanisms) cannot be ascribed to just a particular type of reading of donkey sentences. These sentences can come in different forms and the more complex the form, the shakier the intuitions related to them will be. Sentence (26) below is a case in point.

(26) Most students who took *a course from Peter* last year liked *it* (Kanazawa 1994)

To be sure, speakers do not have firm intuitions about the interpretation assignable to (26).[21]

Therefore, how are we to proceed with examples like this one if we are to accept Chierchia's view? It seems to us that no one clear-cut answer to that question is going to come from that view.

A final objection to Chierchia's proposal has to do with the alleged pragmatical

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[21] Apparently most speakers tend to agree that (26) can be judged true even in situations where half of Peter's students did not liked some of the courses they took from him. See Kanazawa (1994, p. 116)

motivation of the E-type strategy. At first sight, Chierchia's contention looks reasonable as it is widely accepted by many theorists (Neale among them) that E-type strategies can easily implement pragmatic processing mechanisms. However, this does not prevent us to ***syntactically*** implement such readings as well. In particular, E-type strategies may be seen as implementing syntactic generalizations provided by a theory of binding. For example, in Parsons (1978)'s theory the definite descriptions that stand for E-type pronouns are obtained by mere syntactic transformations and, as Heim emphasises, in such a theory, "the relevant matching-relation [between a definite description and a clause containing the indefinite antecedent] is characterized in purely syntactic terms" (Heim 1982, p.74).[22] This conflicts with Chierchia's analysis of E-readings, which compels us to obtain such readings only by pragmatic means and with no recourse to any syntactic constraint. Thus, given that Chierchia's theory assumes that the essential difference between both readings of a donkey sentence relies on different, excluyent, strategies (the binding vs. pragmatics dichotomy), Parson's binding analysis and others similar to it represent a challenge to that assumption. Since Chierchia does not provide any further argument to substantiate the mentioned dichotomy, we must therefore conclude that his proposal remains questionable.

4.2.3 *Are donkey pronouns ambiguous? A misleading criticism*

It is still open to theories defending an internal-to-the-sentence factor as the source of the donkey ambiguity a last alternative: to identify the pronoun and its interaction with the *every* determiner as the precise origin of that ambiguity. Consequently, it is reasonable, before concluding our examination of the donkey ambiguity hypothesis, to ask whether there is any theory holding the donkey pronoun as responsible for the purported ambiguity. This is not a matter of little importance for our purposes here since, as we saw, the Evans-Neale theory is one that explains the donkey anaphora phenomenon just in terms of the pronoun. So, it comes as no surprise to consider that theories sharing views similar to Neale's assume the donkey ambiguity hypothesis as well. For instance,

[22] See also Larson and Segal (1995, p.403).

it has been argued by Chierchia (1995) that the theory formulated by Lappin and Francez (1994)—a proposal clearly influenced by Evans' work—is the most clear example of an E-type theory defending the ambiguity hypothesis.[23] Since Lappin and Francez's theory shall be analysed in detail in the following chapter and our analysis therein differs markedly from Chierchia's, we shall restrict ourselves here to Chierchia's version of such a theory rather than the theory itself.

Chierchia regards Lappin and Francez's proposal as a non-Russellian modification of the E-type strategy, which generates the E- and U-readings by interpreting donkey pronouns as a particular kind of function. This is a function that maps individuals into either a maximal collection or some of the values of such a collection. In the first case, the function is a standard one, while the second represents a choice function. It is then stipulated that when a certain condition is satisfied, the pronoun must be associated with a choice function. This function will, in turn, generate the E-reading. If the aforementioned condition is not satisfied, the U-reading will be generated (see Chapter Five, sections 5.2 and 5.3). Thus, according to Chierchia, our paradigm example (1) can be roughly represented as in (27) and the choice function can be specified as in (28) .

(27) $\exists f \forall x[[\ \text{man}(x)\ \&\ \exists y[\text{donkey}(y)\ \&\ \text{owns}(x,y)]] \rightarrow \text{beats}(x, f(x))\ ]$
(28)) f: a function from men into one of their donkeys.

If the function in (27) is understood as a standard, single-valued function, the reading of the pronoun will come out as *the donkey (or donkeys) owned by a man*; if the function in (27) is understood as specified in (28), the reading of the pronoun in question will come out as *one of the donkeys owned by a man*. Chierchia's conclusion about this analysis is the following.

> [T]his is perfectly analogous to having two interpretations of determiners. It merely shifts the locus of the ambiguity

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[23] Lappin (1989) is the direct precedent of Lappin and Francez (1994). The former was developed independently of Neale's work and appeared before of it.

> from determiners to pronouns. Hence it has little explanatory value (Chierchia 1995, p.118)

We believe that there are straightforward reasons to reject Chierchia's conclusion. To be more precise, one could accept that conclusion if the following facts hold in Lappin and Francez's theory: (a) donkey sentences are genuinely ambiguous for interpreters and (b) donkey pronouns entail a lexical ambiguity at some level of representation. Moreover, the expression "perfectly analogous" in Chierchia's quotation is intended to mean that Lappin and Francez's theory is (conversely) analogous to Rooth's proposal. Thus, by following Chierchia, (a) and (b) could characterize Rooth's analysis too, with the difference that, in such a case, "donkey pronouns" is replaced with "donkey indefinites" in premise (b). Yet both (a) and (b), in our opinion, can be disputed.

On the one hand, given the results of our discussion about the ambiguity test QT above, premise (a) seems dubious. Thus, we are not going to argue further in that direction. On the other hand, (b) is apparently false in both the syntactic and semantic sense. That is to say, it is not true that Lappin and Francez's proposal generates ambiguous representations of donkey pronouns at the syntactic or semantic level. At the syntactic level, that proposal allows us to deal, in the same vein as Neale's theory, with anaphoric pronouns non-c-commanded by their antecedents. However, non-c-commanded anaphora does not entail ambiguities of representations at the syntactic level (i.e. at the LF level). This result was shown as to donkey anaphora in the previous chapter (see Section 3.2). At the semantic level, the presence of functions does not entail any lexical ambiguity affecting the logical form of the representations. Functions are extensional objects and therefore they cannot give rise to any ambiguity at all. Since Chierchia's criticism must assume this obvious fact, the ambiguity that he attributes to Lappin and Francez's theory must concern the ***interpretations*** made available to interpreters by the function in question. Indeed, since the values of Lappin and Francez's functions oscillate between the whole collection of entities in the range and one of the values of that collection (the choice function), the authors assume as a matter of fact that interpreters may read the value of the function in two (or more) different ways. Yet the particular interpretation of functional values ***cannot*** be provided by the formal representation system containing the function. In other words, the presence (or absence) of the condition that triggers one of the readings is not provided by the semantic constraints but by the interpreters themselves. Thus, such readings are rather the consequence of interaction between knowledge about the language system and processing of context and background information. And this way of describing how functional values are to be interpreted corresponds exactly with what the E-type analysis of pronouns stipulates.

There is, therefore, no linguistic ambiguity, i.e. no generation of two or more logical forms, induced by Lappin and Francez's system, as Chierchia contends. On the contrary, representation of functions in that system—as we shall see in Chapter Five—heavily depends on the interaction between parametric factors and extralinguistic information. This interaction determines whether or not $f(x)$ is mapped into the whole collection in its range or into one of the values of that range. Thus, Chierchia's suggestion of a "perfect analogy" between ambiguity of determiners and functional readings of donkey pronouns in Lappin and Francez's sense is clearly misleading. This fact will become clearer in the course of our argumentation in the following chapters. Therein we will show, in agreement with Lappin and Francez's theory, that if donkey pronouns are conceived as fully parametric in nature, the E- and U-readings are not the only available ones. In fact, a wide range of readings can be captured. Finally, since in Lappin and Francez's theory no proper ambiguity can be postulated, there is also no "shift of the locus of the ambiguity", as Chierchia claims.

Thus, it emerges from our previous discussion that acceptance of the pronouns as responsible for the entire donkey anaphora phenomenon (along Evans-Neale or other lines) can hardly entail that donkey sentences are genuinely ambiguous. This is due to the fact that donkey and unbound pronouns, unlike determiners, are naturally sensitive to contextual or parametric information. It is that information that usually helps us to specify the content of the pronouns and thus the different readings. All E-type theories, therefore, must, to a different extent in each case, make room for that information.

Consequently, it seems clear that, in those theories, no semantic ambiguity needs to be invoked. Further consideration of Lappin and Francez's theory in Chapter Five will put us in a better position to appreciate the explanatory power of this conclusion.

From our discussion in sections 1 and 2, three facts become clear. First, we should, on methodological and theoretical grounds, be reluctant to accept theories that assume donkey sentences to be essentially ambiguous and to generate entirely distinct semantic structures. Second, our discussion in Section 2 indicates that such theories take determiners as the source of the purported ambiguity, whether directly—as in Rooth's theory—or indirectly—as in Chierchia's theory. Finally, theories of donkey pronouns constructed on the E-type analysis (for example, Lappin and Francez's theory, which focuses on such pronouns and exploits their contextual or parametric features) need not posit any ambiguity. These three facts immediately suggest answers to the following obvious questions: (i) since no donkey ambiguity theory appears to be acceptable, what other alternatives should be considered that accommodate the evidence of multiple readings associated with donkey sentences? (ii) What elements or constituents of donkey sentences are responsible for the range of such readings?

Concerning question (i), we believe that there are sufficient grounds for preferring a theory that regards donkey sentences as semantically ***nonspecific*** or underspecified, in accordance with our definitions in sections 1 and 2 of Chapter Two. Concerning question (ii), and granted that the answer to (i) has been accepted, it comes as natural to suppose that the pronouns are responsible for the range of readings. For, as we have suggested, such pronouns seem to express referential nonspecificity. In the view preferred in this essay this means that we are going to choose an E- or D-type treatment as the general framework backing the discussion in the forthcoming chapters. Whereas we are going to do so for the rest of the dissertation, it is worth noticing here that there is, as far as we can see, no *a priori* reason to reject other treatments, if they focus on the donkey pronoun and take the latter as the source of the nonspecificity.

4.3 Nonspecificity of Donkey Pronouns: Linguistic and Pragmatic Motivations

We turn now to consider the prospects of applying an analysis in terms of nonspecificity to donkey anaphora. As we saw in Chapter Two, an important amount of nonspecificity of sentences flows from pronouns—indexical and anaphoric ones—(recall examples (9)-(10) in Section 2.2).[24] Unbound pronouns, anaphoric across sentential boundaries, seem to behave the same way. To begin with, consider the following examples below.

(29) *My dog* has escaped. Apparently, *it* was unhappy.
(30) *The father of each girl* cheered her. Then *he* waved to her.
(31) Smith's murderer is insane. *He* should be jailed for life.

Nonspecificity surfaces in each case, although for different reasons. In (29) the reason is just indexicality, transmitted from the NP *my dog* to the pronoun *it*. Sentence (30) (putting aside some technicalities with *her*) shows that, since the denotation of the NP *the father of each girl* depends on the denotation of the NP *each girl*—embedded in the former, the pronoun *he* in the anaphora sentence inherits immediately such dependence. Indexicality and background information play a straighforward role in the task of sharpening the range of readings available in both cases. Finally, sentence (31) shows the extent and pervasiveness of nonspecificity in anaphoric processes. As we shown in Chapter Two (Section 2.1), Kripke (1977), Neale (1990), Recanati (1989, 1993) have aptly argued against many pragmatists[25] that the description *Smith's murderer* can hardly represent a case of ambiguity between a referential and an attributive interpretation. As we indicated, the description in question is rather Russellian in nature, although with referential and nonreferential ***uses*** determined at the level of what is said and not at the level of simply literal truth-conditions. If this view is accepted, then, as Recanati convincingly argues, *Smith's murderer* may be understood as implying indeterminacy or

[24] In fact, quantified determiners can also be semantically underspecified or nonspecific with respect to both scope and aspects of interpretation other than scope. This happens with quantifiers like 'many' and 'few'; see Reyle (1993), van Deemter and Peters (1996) and Alshawi (1996).

[25] Donellan (1966, 1968), Stalnaker (1972), Partee (1972), Kaplan (1978), Barwise and Perry (1983) among others.

nonspecificity between both uses at the level of the linguistic or literal meaning. This view implies that, whatever the properties and uses that speakers may associate with its antecedent, the pronoun *he* in (31) inherits the nonspecificity from its antecedent.

It is easy to realize how, in the above sentences, the pronoun inherits the nonspecificity from their antecedent NP: speakers are going to interpret the former as a copy of the latter. So, for example, the pronoun *he* in sentences (30) and (31) will be interpreted simply as *the father of each girl* and *Smith's murderer* respectively. Speakers do not introduce, therefore, additional specifications of the pronoun, beyond the linguistic and extralinguistic information that the antecedent sentence provides. In other words, the domain of application and the range of readings of the pronouns coincide with the domain of application and the range of readings of their antecedents in the first sentence. Yet if an unbound pronoun interacts with a determiner in a more complex environment, the interpretation of the former will inevitably involve a modification of their range of readings. Intersentential donkey anaphora, i.e. donkey anaphora across sentential boundaries, provides us with the following examples of this sort of interpretation (each example is accompanied with its most probable interpretive counterpart).

(32) If a philosophy student has *a chair*, *it* is in the kitchen.
(33) If a philosophy student has a chair, the chair (or chairs) he/she has is (are) in the kitchen.
(34) *Every farmer* owns *a gun*. *S/he* keeps *it* in a safe place.
(35) Every farmer owns a gun. The farmer keeps the gun or guns he/she owns in a safe place.
(36) Either this house does not have *a bathroom* or *it* is in a funny place.
(37) Either there is no bathroom in this house or the bathroom (or bathrooms) there is (are) in this house is (are) in a funny place.
(38) *A woman* and *a man* arrived in a large truck. *The woman* got out and began dancing in the road while *the man* played the accordian.
(39) A woman and a man arrived in a large truck. The woman who arrived in a large truck got out and began dancing in the road while the man who arrived in a large truck played the accordian; the woman and the man arrived in the same truck and perhaps other women and men arrived in the same truck too.

Sentences (32) and (34) exemplify how speakers manipulate or process information coming from the determiners and the restriction of the antecedent in order to recover the content of the pronoun. This is shown in sentences (33) and (35). Since, according to Neale's theory, the semantic number of unbound pronouns anaphoric on indefinites is indeterminate, those pronouns must be recovered in (32) and (34) as *the chair or chairs* and *the gun or guns*, respectively. Thus, speakers alter the apparent uniqueness of the indefinite in the antecedent sentence and establish a different, wider range of values to which the restriction of the indefinite can apply. Furthermore, speakers recover in a different way the restriction of unbound pronouns of (32) and (34), depending on whether such pronouns are anaphoric on indefinites or on other determiners. The second sentence of (35) makes this contrast evident. There, the restriction of the pronoun *it* in the anaphora sentence of (34)—anaphoric on the indefinite *a gun* in the antecedent sentence—is recovered as *gun s/he owns*. By contrast, in the same sentence (35), the restriction of the pronoun *s/he*, anaphoric on *every farmer* in the antecedent sentence of (34), is recovered, according to Neale's theory, only as *the farmer* (see Chapter Six, Section 6.1, for a discussion of this result). These examples of content recovery show that, in Neale's words, "additional contextual information must be brought into play if a sensible interpretation [of the pronouns] is to be provided" (Neale 1990, p.261). In other words, speakers who interpret discourses containing unbound (and donkey) pronouns cannot simply copy the content of the antecedent. They must modify the interpretation or (range of the) reading determined by that antecedent in accordance with linguistic and extralinguistic information. In addition, as argued by Roberts (1987, 1989), Sells (1985) and Ludlow (1994), sentence (34) represents an apparent exception to the General Scope Constraint ((GSP); see Chapter One, Section 1.2) on unbound anaphora, according to which a pronoun cannot be anaphoric across sentential boundaries on a determiner of the form *every* X. That is to say, an unbound pronoun cannot be anaphoric on a determiner *every* X that precedes it but does not c-command it.[26] For instance, anaphora is apparently

[26] See Heim (1982, pp.199 ff.). She calls simply this constraint the ***Scope Constraint*** and considers it a condition on scope and coindexing of NPs rather than a requirement on 'anaphoric relatedness'. The syntactic formulation is the following: *do not adjoin an NP any higher than to the lowest S node in which it originates.* See also Chierchia (1995), Barwise (1987), and Kamp (1981).

prohibited by such constraints in the following sentence:

(40) ? When *every Italian* is overweight, *he* is happy.[27]

The only way, therefore, of explaining the felicity of such examples as (34) is to suppose that in processing them speakers and hearers make an intensive use of extralinguistic information instead of only applying semantic constraints.

Sentence (36), an example by Barbara Partee, nicely illustrates how overcoming the scope that negative (or monotone decreasing) determiners can have over a donkey pronoun permits the specification of its range of readings in contexts of intersentential donkey anaphora.[28] Thus, speakers and hearers are able to recover a defined range of readings for the pronoun *it* despite the fact that ***the range of the values of the antecedent*** seems empty. The pragmatic basis of all these interpretative mechanisms appears clear when one observes some of their consequences. The most important of those consequences is an exception to another constraint on anaphoric relations: the ***accessibility*** constraint. Roughly, this constraint stipulates that an indefinite can be an antecedent of a pronoun if and only if the closest binder (a quantificational, non-indefinite NP, a negation or an adverb of quantification) c-commanding the indefinite, c-commands the pronoun as well.[29] In such a case, we say that the antecedent is ***accessible*** to the pronoun. It is easy to check that all standard donkey sentences—e.g. 'every farmer who owns a gun registers it'—are licensed for the accessibility constraint, since in those sentences the indefinite (*a gun*) is c-commanded for the same determiner

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[27] It is worth noting here that Neale explicitly rejects the idea that a semantic theory must prevent pronouns from being interpreted as anaphoric on an *every* phrase that does not c-command them; see Neale (1990, pp.232-3)

[28] This conclusion would apply equally well to sentence (36) if its negative determiner were *no bathroom*.

[29] A technical definition of accessibility given by Chierchia (1995, p.8) is as follows:

(i) An indefinite α can antecede a pronoun β iff the lowest binder that c-commands α c-commands β.
(ii) Binder: adverb of quantification, quantificational, non-indefinite NP, or negation.

(*every farmer*) that c-commands the pronoun. Thus, although the pronoun *it* in the anaphora sentence of (36) is not c-commanded by the negative determiner *does not* in the antecedent sentence, clearly the felicity of the sentence overcomes that constraint. Consequently, *a bathroom* cannot be accessible to the pronoun in question. A similar thing happens with the pronoun *it* in (34) that is not c-commanded by *every farmer* in the antecedent sentence.[30] This suggests that hearers process the pronouns in (34) and (36) in direct interaction with context and pragmatics in order to secure the felicity of the anaphoric linkage.[31]

Finally, sentence (38) exemplifies a problem affecting definite descriptions quite generally: the problem of incompleteness of description. That is to say, the problem posed by the use of descriptions like *the F* when (in the utterance context) there is more than one *F*.[32] Felicity of anaphora by using incomplete descriptions as pronouns shows the degree of context dependence that the process of interpreting such pronouns can give rise to. For example, the descriptive reading of (38) in (39) shows to what extent the interpretation of the former depends on contextual information. In other words if, put in the position of using the information in (39), a speaker *s* feels compelled to utter (38), it must be accepted that her interpretation of the semantic number and the restriction of the description in the anaphora sentence of (38) and her use thereby of the determiner *the*

[30] Other examples of sentences that overcome the accessibility constraint are the following:

(i) It is not the case that John does not have *a car*. *It* is parked outside.
(ii) Every chess set comes with *a spare pawn*. *It* is taped under the box (Sells 1985)

[31] Chierchia (1995, p. 9) hints at the same conclusion. He says.

> The key observation in this connection is that anaphora across inaccessible domains is highly sensitive to various aspects of the context —what is known or presupposed by the speaker, the specific properties of the lexical items involved in interaction with what the extralinguistic facts are, and so on.

Finally, Chierchia insists that such underdetermination by the context separates donkey anaphora across inaccessible domains from 'plain donkey anaphora'. We believe, however, that this conclusion can be disputed; see footnote 37.

[32] See Neale (1990, pp. 93 ff.) for an extensive discussion of the implications of this problem for a Russellian approach of descriptions.

will be a matter of contextual specification. Also, the range of readings of the anaphora sentence in (38) will be dependent on the processing of extralinguistic information that other speakers will use in order to interpret the utterance of *s*. Let us take the problem of determining the semantic number as an example. The use of the incomplete descriptions *the man* and *the woman* points out that there are uniqueness implications involved. Thus, the question is to know whether such implications are derivative from the linguistic content of the indefinites *a man* and *a woman*. The answer must be negative, given the fact that (39) involves the possibility of other men and women arriving in the same truck, who can thereby be described equally well by using the same restriction. Therefore, the uniqueness implications in (38) are highly constrained by contextual factors surrounding the utterance rather than by linguistic information. Also, the fact that only one individual can satisfy each incomplete description, i.e. the fact that the range of the individual values can be reduced to one in each description, derives mainly from the intentions, beliefs, and background knowledge that interpreters must attribute to *s* when using such descriptions.[33]

So far we have considered that parameters associated with E-type pronouns are amenable to specifications in terms of semantic number, restrictions, gender, etc. However, we have not addressed another aspect that, as we saw in Chapter Two, Section 2.2, can generate a widespread nonspecificity in sentences: the aspect of plurality. We know already that the appearance of such an aspect is associated with processing of the $\pm Coll(X)$ parameter of sentences containing plural NPs. Therefore, in fragments of discourse containing an E- or D-type pronoun anaphoric on a plural NP, we should expect

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[33] Indeed, as argued by Sellars (1954), Kripke (1977), Sainsbury (1979), Davies (1981), Blackburn (1984) and by Neale (1990), incompleteness is a general problem not just affecting descriptions but the very use of quantified phrases in natural language. According to Neale, if this is the case, a solution for it will require "a quite general account of incomplete quantifiers" rather than a modification of the Russellian analysis (see Neale 1990, p. 242). However, see Larson and Segal (1995, pp. 333-4), for some arguments against assimilation of description incompleteness to quantifier incompleteness.

Other examples of incomplete descriptions underdetermining the recovery of the content of unbound pronouns are the following:

(i) I bought *a donkey* and a horse last week. For some reason *the donkey* will not eat anything.
(ii) Socrates kicked *a dog* and *it* bit him and then he kicked *another dog* and *it* did not bite him

the former to be sensitive to the nonspecificity generated by the latter. This is observed in the following examples (from Neale 1990).

(41) The men washed their hands. Then they went home.
(42) The men carried two pianos down the stairs. Then they loaded them onto a truck.
(43) The men carried two pianos down the stairs. Then they washed their hands.

In each sentence above the classical interpretations of plural sentences are shown unequivocally. The plural pronoun in (41) inherits the distributive interpretation from the antecedent (presumably induced by the VP and the object NP in the antecedent sentence). The plural pronoun in (42) inherits the collective interpretation from the antecedent (presumably induced by the VP and the object NP). Finally, the pronoun *they* in (43) does not preserve the collective interpretation of the antecedent and introduces, instead, the distributive interpretation because of information coming from the VP and the object NP in the sentence. Moreover, the number of readings in each case depends on processing background or contextual information, which will, in turn, affect the ±*Coll* (X) parameter. For instance, in a situation where the men in question are three, there will be at least five readings of the antecedent sentence of (42) and (43) (with +*Coll*(X) parameter), a similar number for the anaphora sentence of (43) (with −*Coll*(X) parameter) and a number of three for the anaphora sentence of (41) (with −*Coll*(X) parameter).[34]

The interpretations above indicate that plural E-type pronouns are as sensitive to plural parameterization as normal plural NPs are. Something similar seems to happen with plural E-type pronouns whose antecedents are ***syntactically*** singular (indefinite) antecedents. Consider the following, perfectly felicitous, examples.

(44) Few farmers bought *a donkey*, but *the donkeys* were hitched together in a short mule train (Schein 1993)

[34] The total number of readings for (43) will be obviously higher due to the combination of the collective interpretations of each sentence.

(45) Every farmer bought *a donkey* and *they* were hitched together in a short mule train
(46) Every student collaborated in *a play* during the year and then *they* were put on to different audiences.

The felicity of sentences (44)-(46) despite the clash in syntactic number between their antecedent and anaphora sentences is well explained in a D-type theory as it assumes the numberless hypothesis for E-type pronouns. Also, in many cases such pronouns seem to refer to collections or groups of individuals—i.e. they get the *+Coll* (X) parameter—despite the singularity of their antecedents. Thus, as indicated by Schein, in examples (44) and (45), the plural donkey pronouns "refer cumulatively to whatever donkeys any farmer bought " (Schein 1993, p. 13). Therefore, clash in syntactic number does not affect the felicity of the anaphoric connection in such sentences. The anaphora sentence of (46) also shows collective or cumulative reference to the donkey pronoun in the antecedent sentence. In addition, (46) shows how collective and distributive interpretations, induced by the VPs and lexical material, can interact with the collection determined by the E-type pronoun. In this case, the verb *collaborate* in the antecedent sentence induces a collective interpretation of the pronoun while the verb *put on,* plus context, reinforces the distributive interpretation of the pronoun.

4. 4 Conclusions and Prospects

From the previous examination of sentences (32)–(38) the following consequences seem to follow: (a) sentences exhibiting donkey anaphora across sentential boundaries are nonspecific or underspecified with regard to linguistic information; (b) the nonspecificity underlying donkey pronouns also explains why hearers appeal to a great amount of processing of contextual information when interpreting them; (c) usually, processing of contextual information is an specification of parametric information pertaining to the pronoun (for instance, semantic number, restrictions, gender, or sensitivity to determiners). That specification, in its turn, will affect the range of readings available in the anaphora sentence. (d) As far as the arguments about donkey anaphora given in

Chapter Three are convincing enough, as we believe they are, we should expect that D- or E-type accounts of donkey pronouns will capture systematically the specifications of the readings donkey pronouns.

From the above picture plus our rejection of the ambiguity hypothesis it follows, we think, an attractive generalization of the nonspecificity hypothesis embracing ***all*** kinds of donkey anaphora and all sentences containing the latter. Similarly, it follows that D- or E-type theories provide an appropriate framework to deal, on the semantic side, with such nonspecificity. Some theorists in the field have informally aired these conclusions. For instance, Neale says (in discussing the semantic import of his rule **P5**),

> when we interpret utterances [of sentences containing D-type pronouns] we [...] bring to bear a lot of background assumption and contextual information, including information derived from preceding utterances [...] and we use this in filling out those aspects of the utterance that are underspecified by linguistic form, including the assignment of referents to those pronouns that are referential and the assignment of descriptive content to some of them that are not. (Neale 1990, p.184)[35]

Kanazawa (1994), more explicitly, makes the following remarks.

> What follows is a pure speculation [...]
> The primary assumption I make is the following:
>
> (109) The grammar rules in general underspecify the interpretation of a donkey sentence.
> Thus, I assume that, for any donkey sentence, the grammar only partially characterizes its meaning, with which a range of specific interpretations are compatible. So the truth value of donkey sentences in particular situations

[35] Elsewhere Neale insists on the generality of the idea by saying:

> the phenomenon of underspecified D-type pronouns is not restricted to cases involving anaphora on singular definite descriptions (Neale 1990, p.242)

> can be left undecided by the grammar. This may not be such an outrageous idea; it may explain the lack of robust intuitions about donkey sentences. (Kanazawa 1993, p.151)[36]

Nevertheless, we think that if the idea of 'donkey nonspecificity' is considered in its own right and not just as a disposable speculation, its powerful appeal becomes clear. Once the idea is couched in an appropriate theoretical background, it enables us to make clear sense of the phenomena under examination. D-type theory (or a variant of it along the lines envisaged in Chapter Three) clearly provides that background. Yet, unlike Neale's D-type theory, the nonspecificity view considers the main features of a D-type theory (namely numberless hypothesis, sensitivity to determiners and recovery of restrictions by using the rule **P5**) to be uniformly connected by the same motivation: to show how interpreters systematically reduce the basic nonspecificity or underspecification of donkey sentences. This is done by manipulating, altering, filling out, etc., with the help of contextual information, parameters located in the representation of the pronouns (for instance, semantic number, gender, maximality of the determiner, etc.). Consequently, the nonspecificity conception provides us with a unified view of the relevant aspects of a D-type theory where they are seen as a set of systematic constraints on the parameters of donkey pronouns.

Equally important, from our arguments in Chapter Two, we have now a clear pragmatic background to support a nonspecificity analysis of donkey sentences. This background—the Gricean enriched story—supplies a simple answer about how we can pragmatically explain the process of disambiguation of such sentences. According to that story, we might say that at the level of the linguistic or literal meaning standard donkey sentences have a unique meaning given by its external truth-conditions. These conditions will correspond to the U-reading. However, as literal meaning does not determine what is in fact said or expressed in uttering the sentence, just the contextual information can

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[36] It is worth noting that, despite this speculative claim about nonspecificity and context, Kanazawa rejects explicitly E-or D-type treatments (see Kanazawa 1994, p.130 n.28). Instead, he endorses the dynamic binding approach to donkey anaphora.

tell us if interpretation of parameters counts as crucial or not (i.e. if it provides a contextual truth-condition or not) to the interpretation of the donkey pronoun. If in a certain context it can, then some reading other than the U-reading must be preferred, in particular, an E-reading. In such a case, the interpretation of the utterance of the sentence will incorporate the E-reading as a part of the content of the general proposition expressed. If, in another type of utterance context, the contextual information is of no help to the interpretation, then the conditions associated with the U-reading will be considered as full-blooded truth-conditions and the (general) proposition expressed by the utterance will incorporate such a reading as a part of its content (see Chapter Two, Section 2.1). Notice that, at this point, disambiguation of donkey sentences is a matter quite independent of the problem of the ***usages*** of definite descriptions. That is to say, the discussion about the referential (or non-referential) nature of the pronouns has no direct impact on the selection of E- or U-reading, because under both readings we can implement referential or non-referential treatments of the pronouns. However, the issue of referentiality is crucial in trying to explain how speakers and hearers can deal with pronouns unspecified by the grammar (see Chapter Five, section 5.5).

We think that the nonspecificity conception has much to commend it. And although some theoretical resistance to it might be found,[37] the enormous descriptive advantages that

[37] Perhaps the most important of these objections has to do with accessibility. In terms of accessibility, our generalisation implies that donkey pronouns are nonspecific and, thereby, context dependent in both inaccessible and accessible domains. Nevertheless, as we indicated in footnote 33, it has been argued by Chierchia (1995, pp.9-10) that plain donkey anaphora in accessible domains does not seem to be affected by contextual or pragmatic factors but rather it is "governed essentially by structural factors." We believe that one can reduce the force of this potential objection by appealing to a number of reasons. First, we think that, however valuable the Accessibilty Hypothesis may be, as a syntactic claim, it cannot support adequately prohibitions or constraints on what can or cannot be pragmatically processed. In fact, we have seen before that both Accesibility Constraint and Heim's Scope Constraint, are overcome when speakers process contextual information across sentential boundaries. Therefore, imposing conditions on what can be processed in an accessible domain seems at least artificial. Also, as we will see in Chapter Six, complex sage plant cases, i.e. examples of plain donkey anaphora, can succesfully be treated if we assume a strong interaction between lexical information and contextual conditions on the parameters of the pronouns. Second, there is no theoretical prohibition to translate the linguistic meaning of sentences which generate donkey anaphora across inaccessible domains into plain donkey anaphora sentences. For instance, the linguistic meaning of sentences (32) and (34) above may be translated by means of the following sentences:

(32') Every philosophy student who has *a chair*, has *it* in the kitchen.
(34') Every farmer who has *a gun*, keeps *it* in a safe place.

the theory offers, we suggest, should be weighted in favour of it when formulating its final evaluation. In particular, most problems lurking around Neale's original theory (E-readings, sage plant cases and telescoping cases) can be successfully dealt with by using some version of the nonspecificity account, as we shall show in the following chapters.

Third, the rule of accesibility is overcome when we combine a standard plain donkey anaphora with incomplete descriptions in inaccessible domains. For instance, compare examples (i) and (ii) below. This applies to plural sentences as well (see sentences (44)-(46) above).

(i) ? Every farmer who has *a cow* keeps *it* in a safe place. *It* is happy.
(ii) Every farmer who has *a cow* keeps *it* in a safe place. *The cow or cows* are happy

Fourth, finally, it seems clear that the Accessibility constraint for indefinites cannot be held valid for every natural language. For instance, in Spanish, sentences like the following are perfectly acceptable:

(iii) Siempre que Maria tiene *un gato lo* maltrata. Ademas, *lo* obliga a estudiar semántica y, a veces, *lo* obliga a estudiar lógica.
[Every time Maria has a cat batters it. Also, she forces it to study semantics and sometimes logic]
(iv) Todo profesor de logica que tiene *algunos gatos los* malcria. *Les* cuenta historias extravagantes y de vez en cuando *les* tira un filete.
[Every lecturer of logic who owns some cats spoils them. He tells them bizarre stories and, sometimes, gives them a fillet.]

CHAPTER V

THE FUNCTIONAL TREATMENT OF DONKEY NONSPECIFICITY

In this chapter the claim that donkey sentences are nonspecific in nature is technically substantiated. We argue that, torn between two general ways of dealing with nonspecificity, the scalar and the functional account, we should consider, from a methodological point of view, the latter as more suitable than the former to tackle donkey anaphora. The option for the functional account agrees with two general views defended in chapters 2 and 4: (a) representing the meaning of context-sensitive sentences (or discourses) is an issue about representing functional dependencies, and, (b) disambiguation of nonspecific sentences (or discourses) involves a relation between external truth-conditions and the proposition expressed by the utterance in a given context. Application of these general views to the problem of donkey pronouns will provide us, as we shall show, with a theoretically illuminating and empirically successful solution.

Our reasoning in favour of a functional conception of nonspecificity of donkey sentences is as follows. First, by drawing on work by Heim (1990), Gawron, Narbonne and Peters (1991), Chierchia (1992), and Lappin and Francez (1994), we show that the nonspecificity of donkey sentences is an expression of functional dependency to be located in the pronouns of those sentences. Such pronouns incorporate parametric information supplied by linguistic and extralinguistic factors. E-type and donkey pronouns can thus be seen as context-dependent functions, which are an essential part of the representation of the sentences containing them. Furthermore, distinct readings of donkey sentences will be generated as long as the parameters involved are specified. By contrast, if those parameters are not specified, the sentences will remain nonspecific at the semantic level of representation. This agrees with the chief idea motivating the nonspecificity view, namely that at the level of interpretation nonspecific sentences must be assigned a single semantic representation from which particular specifications can be derived.

Second, a functional nonspecifity view of donkey sentences allows us to explain a broad range of irregularities associated with those sentences. This is possible we think if the functional conception underpinning the nonspecificity view is adequately modified and extended. A fundamental modification is the introduction of formal constraints that permit us treating donkey pronouns as choice functions. These functions select, given certain structural conditions, only one value from a previously specified range. So extended, the functional treatment generates a set of readings of donkey sentences that cover some important irregularities, in particular E-readings and sage plant cases.

Third, functional treatments clearly explain important cognitive assumptions that speakers appeal to when considering propositions involving E-type pronouns. We argue in particular, in accordance with our arguments in Chapter Two, that speakers are committed in such linguistic contexts to unspecified reference and to the mechanisms that that sort of reference involves.

5.1 Scalar Nonspecificity and Donkey Anaphora

If the account of nonspecificity of donkey sentences expounded in the last chapter has some chance to work, it should enable us to meet at least the following three requirements: (a) to fix the semantic content of donkey sentences by means of a unique basic representation; (b) to make sure that their basic representation is mapped into only one linguistic representation (LF, SS or other structures); and (c) to show that the basic representation bears a logical connection to all relevant interpretations or readings of donkey sentences. Requirements (a)-(c) seem quite clear *desiderata*. Requirement (b), in particular, is satisfied by such donkey anaphora approaches as Neale's because of their clear LF motivations. When it comes to the implementation of requirements (a) and (c), however, there is no unequivocal way of proceeding. In order to clarify the problem posed by (a) and (c) we will need to discuss some general issues involving nonspecificity.

The problem with (a) and (c) is rather methodological and has to do with how the basic representation (whatever it may be) of a nonspecific sentence is defined. If we define that representation in terms of literal truth-conditions only, the range of readings of the sentence will be generated only by the external meaning of the sentence, that is, by the specification of its external truth-conditions. This option will thus raise a ***truth-functional*** conception of nonspecificity. If we define the basic representation in terms of both contextual information and truth-conditions, the aforementioned range of readings of the sentence will further be specified. Since each reading of this extended range will be selected by taking into account parametric factors, this option will in its turn define a ***parametric*** conception of nonspecificity.

On the truth-conditional account of a nonspecific representation, the basic problem posed by (a) and (c) is determining which reading—formulated in a FOC, restricted quantifier (RQ) or another structure—embraces the rest of the readings. As the literature about nonspecificity suggests, the problem above is twofold: on the one hand, it implies the problem of finding out a sufficiently nonspecific representation entailed by all remaining readings; on the other hand, it is necessary to show that the purported basic representation is effectively able to generate, by appealing to special procedures of derivation the remaining readings.[1] Those procedures will give rise to particular

[1] This is particularly clear in the literature on plurality; see Chapter Two, Section 2.2 and Landman (1996)

entailment (or quasi-entailment) relations between the logical forms thus derived. Hence the truth-conditional view of nonspecificity originates a so-called ***scalar*** treatment of nonspecificity, according to which the different logical forms associated with a nonspecific sentence will be derived by a rules set reflecting the particular semantics and syntax of the sentence.

In the parametric view of nonspecificity, by contrast, there is no problem with particular entailments between readings. For according to this view the basic representation of a nonspecific sentence is strongly dependent on information supplied by context and background, i.e. by speaker's (and hearer's) presuppositions, beliefs, expectations, etc. This implies that the connection between the basic representation and the specific readings cannot be a logical (or quasi-logical) one. It will rather depend on how, in processing contextual information, speakers fill in the parameters of the nonspecific representation. Problem (c) therefore is not relevant on the parametric view of nonspecificity. Problem (a), however, is equally crucial for it. Since, as we shall see, on the parametric view referential nonspecificity must be disambiguated through particular context-sensitive functions, the parametric view will give rise to a ***functional*** treatment of nonspecificity. Under this treatment, the relevant readings of a nonspecific sentence are generated when the context-sensitive functions are appropriately processed by interpreters. Problem (a) on the parametric view is therefore equivalent to that of finding out an adequate function and appropriate constraints on the latter that match our semantic and linguistic intuitions about the nonspecific sentences under examination.

The two aforementioned views of sentential nonspecificity provide us with two possible routes for treating the nonspecificity of donkey sentences. Both treatments have clear antecedents in the semantic literature and offer different solutions to the problem at hand. We think however that there are good reasons to be sceptical about the scalar approach and optimistic about the parametric approach. In order to substantiate this claim, we shall examine a well-known scalar account of nonspecificity: a theory of nonspecificity of plurals defended by Kempson and Cormack (1981a). Next, we will evaluate the prospects of applying that theory to donkey nonspecificity. We will suggest that the reasons to be sceptical about this theory are mainly methodological. They nevertheless do not coincide in some respects with some of the general criticisms voiced against the theory, which we believe can be resisted.

Although Kempson and Cormack's theory is designed to primarily deal with plural sentences like (1) below, its implications for other cases of nonspecificity are clear.[2]

(1) Two examiners marked six scripts.

The main question that Kempson and Cormack tried to answer about sentences like (1) was whether they can be assigned a single semantic representation from which "distinct specific interpretations, the propositions, [...], are derived from the single semantic representation by general rules" (Kempson and Cormack 1981a, p. 260). If the answer were positive, they contend, the sentences should qualify as nonspecific. If the answer were negative, the sentences should qualify as ambiguous. Also, according to Kempson and Cormack, those sentences may qualify as nonspecific despite exhibiting an apparent scope ambiguity at the surface level.

Kempson and Cormack argue that if the potential readings or interpretations of a sentence S are, say, R_1 and R_2, and R_1 entails R_2, then S is ***not*** ambiguous between R_1 and R_2 but nonspecific. The logical form (or **lf**) of S will be the one assigned to the entailed reading—that is, R_2. Due to their claim that sentences like (1) are nonspecific, Kempson and Cormack's main effort is dedicated to showing that such sentences need to be represented by the basic entailed reading only. Thus, in terms of this theory such a reading will be the 'logically weakest', namely a sequence of (in)existence claims about the individuals in the given domain. We will call this argument, the 'ordering by

[2] Verkuyl and van der Does (1996) and Verkuyl (1993) defend, within a model-theoretic framework, similar views of plural sentences.

entailment' argument.[3] Kempson and Cormack's next step is to extend their argument to all quantified sentences where a scope ambiguity appears. This happens, for instance, in the sentence (2) below.

(2) Every linguistics student has read a book by Chomsky.

In first-order logic sentences like (2) can be associated with the two interpretations (2a) and (2b) below depending on whether the *every* or the *a* determiner takes wider scope.

(2a) $(\forall x)\,(Lx \rightarrow ((\exists y)\, By \,\&\, Rxy))$ (weak reading)
(2b) $(\exists y)(\, By \,\&\, (\forall x)(Lx \rightarrow Rxy))$ (strong reading)

Since (2b) entails (2a), Kempson and Cormack go on to claim that (2a) should be chosen as the single logical representation of (2). Hence they conclude that any sentence similar to (2) should be treated as nonspecific rather than ambiguous.[4]

Kempson and Cormack propose some particular rules (together with pragmatic constraints) in order to generate a stronger reading from a weaker reading, provided that between the former and the latter it holds some entailment relation. For instance, they propose a rule that replaces existential quantifiers binding invidividual variables by universal quantifiers binding the same variables. This is their so-called *Generalising Quantifier* rule (GnQ).[5] A simplified second-order formulation of this rule in terms of the restricted set notation introduced in Chapter Two, Section 2.2, is given below.

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[3] The term was coined by Tennant; see Tennant (1981, p. 313).

[4] Kempson and Cormack (1981a, pp. 265–6). The idea of dispensing with scope ambiguity was initially defended by Reinhart (1979); see Chierchia and McConnell-Ginet (1990,p. 116).

[5] See Kempson an Cormack (1981a, p. 271). The authors offer another rule—the *Uniformising rule*—which reverses the order between first-order universal quantifiers and second-order existential quantifiers. As they indicate though this rule can be dispensed with when generating stronger readings from plural sentences; see Kempson and Cormack (1981a, p. 277).

(GnQ) : replace '$[\exists X{:}|X|\geq n][\underline{(\exists x)\ x\in X}]$' by '$[\exists X{:}|X|\geq n][\underline{(\forall x)x\in X}]$'

According to Kempson and Cormack (GnQ) allows us, granted that the weakest reading of (1) is represented in (3) below, to scalarly generate all readings of sentence (1) mentioned in Chapter Two.[6] Thus, (GnQ) will license quasi-entailments between (3) and the readings in (4)–(7).[7]

(3) $[\exists X{:}|X|\geq 2]\ [\exists S{:}|X|\geq 6]\ [(\exists x)x\in X]\ [(\exists s)s\in S]\ (Mxs)$

(4) $[\exists X{:}|X|\geq 2][(\forall x)x\in X]\ ([\exists S{:}|X|\geq 6][(\forall s)s\in S]\ (Mxs))$ (*distributive reading*)

(5) $[\exists S{:}|X|\geq 6][(\forall s)s\in S]\ ([\exists X{:}|X|\geq 2][(\forall x)x\in X]\ (Mxs))$ (*semidistributive reading*)

(6) $[\exists X{:}|X|\geq 2]\ [\exists S{:}|X|\geq 6]([(\forall x)x\in X]\ ([(\exists s)s\in S](Mxs))\ \&\ [(\forall s)s\in S]\ ([(\exists x)x\in X](Mxs)))$
(*collective reading*)

(7) $[\exists X{:}\ |X|=2]\ [\exists S{:}\ |X|=6]\ ([(\forall x)x\in X][(\forall s)s\in S]\ (Mxs))$ (*cumulative reading*)[8]

(Predicates 'X', 'S' stand for the set of examiners and the set of scripts respectively; 'M' stands for the predicate *mark*)

At this stage, one can envisage the following reasoning: Had Kempson and Cormack's theory succeeded in explaining plural sentences, then equally successful applications to other areas should be expected. On this hypothesis, there would be good reasons to extend the scalar theory to a **D**-type theory and thus solve some of the scope interaction problems affecting the latter (examined in Chapter Three). In particular, the generation of U- and E-readings in donkey sentences could also be explained in terms of some

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[6] Kempson and Cormack's rules overgenerate. They argue, however, that overgeneration can be handled by imposing some pragmatic filters at the level of propositions, i.e. at the level of utterance of the sentences. See Kempson and Cormack (1981, pp. 278ff.). Nevertheless, see Kempson and Cormack (1981b) for some persistent generation problems affecting their analysis.

[7] An example of these quasi-entailments is specified by means of the following derivation of the distributive reading:

(i) $[\exists X{:}|X|\geq 2][(\exists x)x\in X]\ [\exists S{:}|X|\geq 6]\ [\exists(s)s\in S]\ (Mxs)$ (Logically eq. to (3))
(ii) $\exists X{:}|X|\geq 2][(\forall x)x\in X]\ ([\exists S{:}|X|\geq 6][\ (\forall s)s\in S]\ (Mxs))$ (GnQ)

[8] As indicated in Section 2.2, the reading (7) cannot contain '$\geq$'.

particular entailment ordering underlying those readings. There are, however, several reasons against such an extension. Some of them have to do with the critiques that Kempson and Cormack's theory has faced.

Kempson and Cormack's theory has faced two basic critiques. The first one concerns the ordering by entailment argument, the second concerns the status of Kempson and Cormack's procedures of generation. The first critique has led into two directions. First, as indicated by several theorists (Bach (1982), Schein (1993) and Poesio (1996)), approaches like Kempson and Cormack's face a descriptive problem. For it is not clear that a sentence with two quantifiers always possesses two interpretations, one of which entails the other. For example, (8) below does not have an interpretation weak enough to be entailed by all the others, and yet apt to capture all truth-conditions of the sentence.[9]

(8) Few philosophers attend many linguistics conferences.

Second, the chief objection to the ordering by entailment argument involves a problem with logic and compositionality. This critique has been voiced by Chierchia and McConnell-Ginet (1990) and Poesio (1996). The ordering by entailment argument as applied to sentences like (2) pressuposes the validity of the following entailment schema.

(9) $\exists\forall \rightarrow \forall\exists$

By the logical law of contraposition, (10) follows from (9).

(10) $\neg\forall\exists \rightarrow \neg\exists\forall$

The problem, as noticed by Chierchia and McConnell-Ginet, is that "negation reverses

[9] See Poesio (1996, p. 182) and Schein (1993, p.296). In addition, Schein shows that similar results obtain if, instead of *few* or *many*, we use non-increasing/non-decreasing quantifiers like *exactly n*. Schein is here reacting to Verkuyl and van der Does (1996) that, unlike Kempson and Cormack's theory, posits the semidistributive reading (5) as the weakest one.

entailments such as the one in [(9)] [...]. So $\neg \exists \forall$ is the more general reading (the entailed one)" (Chierchia and McConnell-Ginet 1990, p. 118). Let us suppose that instead of (2) one utters the negation of (2), as shown in (11). According to Kempson and Cormack's theory the basic semantic representation of (11) will be the negation in (12) (the negation of the weak reading (2a)).

(11) It is not the case that every linguistics student has read a book by Chomsky.
(12) $\neg ((\forall x) (Lx \rightarrow ((\exists y)By \;\&\; Rxy))$

So, we end up predicting that the meaning of (11) should be given by its strongest and not its weakest interpretation, against what is predicted by the theory. Therefore, as argued by Poesio, "one either has to give up compositionality for sentences like [(2a)], or to abandon the strategy of letting sentences denote their weakest interpretations" (Poesio 1996, p.182).

The second critique, as we said, concerns Kempson and Cormack's procedures. It has been stated by Tennant (1981) and Davies (1989). According to them the basic problem is that Kempson and Cormack's rules lack a clear semantic motivation, what makes the approach theoretically unaccountable and its generative force arbitrary. Tennant in particular claims Kempson and Cormack's procedures "simply bash one well-formed formula of higher order logic into another... But the mangling of meanings by the procedures makes nonsense of the claim to have found a logical form ... 'common to each of the possible distinct interpretations' " (Tennant 1981, pp. 317–8). The problem seems to lie in the formulation of the procedures themselves. Thus, Davies concludes that "the ... question is whether the general rules ... can belong to the semantic component of a total theory, given that they are formulated as syntactic rules. Something like this question might lie behind Tennant's complaints that [Kempson and Cormack's] procedures 'simply bash one well-formed formula of higher order logic into another' " (Davies 1989, p. 297).

The two general critiques above can we believe be evaluated differently, no matter the appreciation one may have of Kempson and Cormack's theory. On the one hand, the objections to the ordering by entailment argument affect the general descriptive capacity of the theory and are not specifically related to Kempson and Cormack's nonspecificity treatment of plural sentences. Within a strictly truth conditional setting such objections are we think apt and trenchant. On the other hand, the objection regarding the status of the procedures is directly related to the nonspecifity treatment of plural sentences that the theory proposes. In this case it seems to us the objection is not decisive. There are several reasons that support this opinion, which we shall examine next.

The objection to Kempson and Cormack's rules has emphasised two basic points: first, the procedures of generation of the theory are intended as syntactic devices and yet end up doing semantic work. Second, there is no clear rationale, grounded in a general semantic theory, for such a move. There are, we believe, two ways of countering the first point. In the first place, as far as the formulation of (GnQ) is concerned, one could say that such a rule does not differ in type from the standard natural deduction rules in first-order logic. An example of these rules is the existential instantiation rule governing the universal quantifier in nonempty domains. As we all know although this rule can be syntactically characterized, it can also be considered as expressing wide semantic generalizations. This consideration is what justifies the systematic incorporation of the rule in a total semantic theory. And this is not the only case in point. A similar semantic/syntactic consideration happens to the notion of scope. In fact, the notion of scope can be formulated in syntactic terms and seen as matching semantic generalizations.[10] However, scope may also be formulated in semantic terms and seen as matching syntactic generalizations in a logical system.[11] In the second place, as Kempson and Cormack show, their rules are similar to rules dealing with plurals in other semantic accounts. In particular, Kempson and Cormack's rules are strictly analogous to game-

[10] See Chomsky (1977), Reinhart (1979) and Higginbotham (1980).

[11] See Russell (1905), McCawley (1968) and Lakoff(1970).

theoretic semantics rules.[12] We conclude that either the charge of 'formula bashing'—that is, arbitrariness—brought against Kempson and Cormack's rules applies to all semantic accounts whose rules are isomorphic with the first, or, if not additionally substantiated, the charge must be dropped.

Concerning the problem of absence of an adequate rationale, this is not so worrying in the light of the previous remarks. Moreover, it is not true that Kempson and Cormack's rules are semantically unmotivated. In general, such rules respect all the relevant semantic constraints. On the one hand, the whole purpose of readings (4)–(7) is motivated by assignments of quantifier scope, which determine, in their turn, the different interpretations of the sentences. For instance, (4)—the distributive reading—is called by Kempson and Cormack the 'subject NP with wide scope' reading. (5)—the semidistributive reading—is called the 'object NP with wide scope' reading. (6)—the collective reading—is the reading in which both NPs can take wide scope simultaneously (Kempson and Cormack call it the 'incomplete group' reading). Finally, (7) is obviously the 'scopeless' reading for both NPs (they call it the 'complete group' reading). It should be easy to show that Kempson and Cormack's procedures respect assignment of scope at the level of interpretation. For example, they are not going to generate from a first-order logic formula such as '$(\forall x)(\exists y)$ (Mxy & Fy))', the second order formula '$\exists X$: $(\forall x)$ Mxy & $\exists Y$: $(\forall y)$Fy' with the variable 'y' free in the first conjunct. On the other hand, existential assumptions are crucial for Kempson and Cormack. According to them plural propositions are always referentially dependent. In others words, it is assumed that the relevant domains of the sentences above are nonempty.[13] This assumption warrants purely existential statements as representing the weakest readings of the sentences. We conclude that, given the above assumptions, the objection to the motivations supporting Kempson and Cormack's nonspecificity approach of plural sentences can be resisted.[14]

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[12] See Kempson and Cormack (1981b) and Tennant (1981).

[13] See Kempson and Cormack (1981a, p. 302 n.1 and p.304 n.5)

[14] See Quezada-Pulido (1996) for further discussion.

In the picture emerging from the previous discussion, the theory in question loses part but not all of its initial attractiveness. If the objection to the ordering by entailment argument is as we think granted, the application of the theory to cases of scope ambiguity cannot be guaranteed. The theory turns thus less general because one of its explicit aims was to deal with such ambiguities. As far as the donkey anaphora problem is concerned however this conclusion should not have a major import. First, because if our arguments are correct, donkey sentences are not ambiguous at all (see Chapter Four, Section 4.2).[15] Second, because the arguments against Kempson and Cormack's rules and their applicability to nonspecific plural sentences are not compelling enough. We can be led therefore to consider the possibility of extending the theory in question to donkey anaphora cases. That is to say, we can by analogy with the treatment of plural sentences produce some particular rules, isolate the weakest reading and scalarly generate the remaining donkey readings. The feasibility of this kind of construction can it seems to us not in principle be disputed. There is nevertheless a clear methodological limitation to what can be expected of that construction. In order to see that, let us flesh out a bit how this scalar version of donkey anaphora could be constructed.

Let us arbitrarily suppose that there does exist a rule analogous to (GNP) in Neale's D-type theory, and let us call it the *Generalized D-type Quantifier* rule or, in short, (GnD-type). The content of (GnD-type) could go as follows: *every time that Neale's **P5** is applied to a sentence containing a donkey pronoun, apply (GnQ) to the weakest reading of the pronoun and/or its antecedent*, i.e. *apply (GnQ) to the purely existential representations of the pronoun and the antecedent*. Suppose for the sake of the argument that after applying **P5** to a standard donkey sentence we obtain the structure (13) below. (13) will express, according to Kempson and Cormack's theory, the weakest reading both of the pronoun and the antecedent of the sentence (we are not going to use restricted set quantifiers here; instead, we are just going to underline the weakened (existential)

[15] Obviously this claim is intended to apply only to standard donkey sentences where the indefinite is confined to the restrictive clause. In other cases, where the indefinite interacts outside the restrictive clause with other quantifiers of the sentence, scope ambiguity can be expected.

quantifiers in the form '$\underline{\exists x}$').

(13) [$\underline{\exists x}$: x man & [a y: donkey y](x owns y)] ([$\underline{\exists z}$: donkey z & x owns z](x beats z))

Structure (13) may be interpreted, along Kempson and Cormack's lines, as 'there is at least one man of whom is true he owns a donkey and there is at least one donkey of which is true it is owned and beaten by the man'. From (13) we can then derive by using (GnD-type) the readings in (14) and (15).

(14) [$\forall$x: man x & [a y: donkey y](x owns y)]([$\underline{\exists z}$: donkey z & x owns z](x beats z))
(15) [$\forall$x: man x & [a y: donkey y](x owns y)]([$\forall$z: donkey z & x owns z](x beats z))

Sentences (14) and (15) correspond to the E- and U-readings of the standard donkey sentence respectively. That is to say, (14) can be interpreted as 'for all men who own a donkey there is at least one donkey that they own and beat' and (15) as 'every man who owns a donkey beats every donkey he owns'. Moreover, it is clear that by using (GnD-type) and Neale's theory, we can generate the E- and U-readings of other donkey sentences. For example, 'if *a man* owns *a donkey*, *he* beats *it*', 'every man who owns *two or more donkeys* beats *them*', or 'if John owns *several donkeys*, he beats *them*'.

These initial applications seem to count in favour of the scalar theory. However, before evaluating the theory we need to look at cases where interaction with context is more transparent. For instance, consider the following cases.

(16) John bought *some floppy disks*. Today, he put *them* in his office with some other floppy disks he bought.[16]
(17) Every man who bought *a beer* bought five others along with *it*.
(18) *A woman* and *a man* arrived in a large truck. *The woman* got out and began dancing in the road while *the man* played the accordion.

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[16] This example comes from Neale (1990, p. 242). It is used by Neale in order to show the underspecified nature of D-type pronouns anaphoric on plural antecedents.

A quick look at the intuitive readings associated with sentences (16)–(18) allows us to conclude that they cannot be obtained by using (GnD-type). For instance, the unbound pronoun *them* in the anaphora sentence (16) cannot be adequately represented either by the weaker reading '[$\exists$x :floppy disk x & John bought x]' or by the stronger reading '[$\forall$x: floppy disk x & John bought x]'. Readings implying that John put in his office ***at least one*** floppy disk he bought or that he put ***every*** floppy disk he bought are not acceptable, in the first case because the plural pronoun syntactically implies more than one floppy disk, and in the second case because we know from the context that John had already other floppy disks in the office. As to sentence (17), an example of sage plant sentences, the scalar approach fails for similar reasons. We do not want (17) to be equivalent to '[$\exists$x : beer y & x bought y]' or to '[$\forall$y: beer y & x bought y]', because either reading will lead to incorrect predictions of the truth-conditions of the sentence. As expected, the same happens with the representations that the scalar approach generates for (18).[17]

These drawbacks show that there is an important methodological limitation in the way Kempson and Cormack conceive nonspecificity, which affects their conception about both quantified sentences and plural ones. As we saw in Chapter Two, Section 2.2, nonspecific sentences strongly interact with context. This is clear in the case of plural sentences. As we argued there, the potential readings (4)–(7), generated only by using scope mechanisms, do not exhaust the possibilities of specification of a plural sentence. This is an insufficient picture because scope mechanisms can neither discriminate nor generate the contextual specifications of the plural sentence.[18] We learned that those specifications can be obtained only when the parameter $\pm Coll(X)$ is filled in with information coming from other parameters, for instance, time, structure of agency, VPs etc. We argued that similar informational dependencies surface in such donkey sentences as (16)–(18). Finally, we concluded that the (relative) specifications of those sentences are a consequence of both semantic constraints and processing of contextual information.

[17] See Quezada-Pulido (1996) for other counterexamples to (GnD-type).

[18] Davies (1989) makes a similar point regarding the number of readings provided by Kempson and Cormack's theory

In correspondence with the previous conclusion we are now led to conclude that a general conception of nonspecificity that allows for parametric dependencies seems clearly preferable to a scalar conception. Moreover, this conclusion will apply to scalar approaches irrespectively of the pragmatic constraints that the first may impose on their potential readings. Thus, the methodological limitations above are the main reason that should deter us from pursuing any scalar approach of donkey nonspecificity.

5.2 A Choice Function Treatment of Donkey Anaphora

As far as we know, no functional account of semantic nonspecificity as delineated in Section 5.1 has ever been defended in the semantic literature. However, we believe that several functional proposals dealing with donkey anaphora offer a common basis for elaborating our account of donkey sentences. Thus, what follows can be seen as the consequence of a broad generalization over those theoretical proposals.

The roots of the functional or parametric conceptions of donkey anaphora can be recognized in early work by Cooper (Cooper 1979). However, explicitly functional theories start to be developed in work by Engdahl (1986), Heim (1990), Gawron, Nerbonne, and Peters (1991), Chierchia (1992, 1995), van der Does (1993b) and Lappin and Francez (1994), among others. It is important to point out here, given the general nature of our claims, that we will avoid discussing specific commitments of these approaches to particular syntactic views. Our position here, at least as far as levels of representation are concerned, is rather neutral. The only syntactic principles that we do hold in that respect are, on the one hand, the existence of some disambiguated level where nonspecific sentences receive only one representation and, on the other, the introduction of something like co-indexing in the structures generated at such a level (see Chapter Four for detail).

A most general agreement among theorists working in a functional approach is that the source of the anaphoric linkage lies in the pronouns rather than the determiners. This agreement can be broken down into the following three claims shared by most of those theorists: (*i*) donkey pronouns are E-type (or D-type) in nature, i.e. they go proxy for definite descriptions when being interpreted; (*ii*) E-type pronouns are recovered with the help of context and pragmatics[19] and (*iii*) uniqueness hypotheses in E-type pronouns must be rejected. In turn, while (*i*) is implemented the same way for all these theorists, they differ with respect to the way of implementing (*iii*).

Implementation of (*i*) is carried out by interpreting the E-type pronoun as denoting a proper function. The function in question is a normal one in that it determines the usual relation holding between (the arguments of) its domain and (the values of) its range, and according to which each element of the former is associated with (or mapped into) only one element in the latter. The function is therefore single-valued and denotes extensionally defined objects.[20] As to E-type pronouns, the domain of the functions representing them is in principle constituted by entities of some basic semantic ***type***, for example, individual objects. As we shall see later, this view of the domain must be extended to cover other semantic types.

Thus, the content of principle (*i*) can be expressed by means of the following first functional constraint.[21]

(FuC) (a): E-type (or D-type) pronouns can be considered as denoting a function $f(x)$ of the appropriate semantic type.

To the unavoidable question about how to interpret the value of f in (**FuC**), the initial answer is—in accordance with suggestions given by Cooper (1979)—to appeal to

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[19] Most of them reject in particular a Uniqueness Constraint defended by Kadmon (1987, 1990); see also Chapter Three, Section 3.4.

[20] For more detail on functions see Partee, ter Meulen and Wall (1993, ch. 2).

[21] See Heim (1990, p.138)

contextual salience of the functions.[22] Therefore (and without any further argumentation by now) we may add to the constraint (a) above the following one—that incorporates, in turn, claim (*ii*).

(FuC) (b): f(x) refers to an in principle contextually salient entity of the appropriate type.

Armed with **(FuC)** (a)+(b), one can easily show how a full range of examples are now amenable to the functional treatment. In particular, sentences (19)–(21) below fall in this category.

(19) Every man except John put *his paycheque*$_i$ in the bank. John gave *it*$_i$ to his mistress.
(20) Either Dillon's does not have *a bathroom*$_i$ or *it*$_i$ is in a funny place.
(21) Every man who owns *a donkey*$_i$ beats *it*$_i$.

(19') and (20') below express the functional representation of the donkey pronouns in (19) and (20) (the representation is accompanied by an intuitive specification of the function).

(19') Every man except John put his paycheque in the bank. John gave f(john) to his mistress.
f: a function from individuals into their paycheques

(20') Either Dillon's does not have a bathroom or f(Morris Hall) is in a funny place.
f: a function from places into bathrooms located in those places.

The specification of the function in (19') provides the E-type reading of the pronoun *it* in (19), that is to say, *John's paycheque*. The specification of the function in (20') provides the E-type reading of the pronoun *it* in (20), that is to say, *Dillon's bathroom*. For standard donkey sentences such as (21) a simple FOC representation as in (21') can be provided.

[22] The reader should recall from our discussion in Section 3.2 that donkey anaphora theories relying only on salience may be heavily criticized. Thus, claim (*ii*) must be seen rather as a necessary but not sufficient condition for the interpretation of donkey pronouns in discourse.

(21') $(\forall x)\,[\,[\,\text{man}\,(x)\ \&\ \exists y\,[\,\text{donkey}(y)\ \&\ \text{owns}(x, y)\,]\rightarrow \text{beats}(x, f(x))\,)\,]$
f: a function from men into the donkeys they own.

The specification of the function in (21') yields the standard E-type reading of the pronoun *it* in (21).

As could be expected, sentence (21) leads us immediately to the problem of the uniqueness assumption examined in Chapter Four. By claim (*iii*) above we know the functional conceptions must reject uniqueness implications. Yet in order to evaluate the explanatory force of each functional approach the way it implements this rejection becomes crucial. A first suggestion to implement that rejection is to rely on **FuC**(b) above, i.e. on the contextual salience of the function. This suggestion can however hardly be accepted. For if we are to assume non-uniqueness, the contextual salience of the functions may make the problem even more pervasive. Heim clarifies the issue as follows:

> If there is to be any salient function for the variable f to refer to here, and if that function is supposed to have been made salient solely because the listener has understood the initial portion of the sentence, it is presumably once again the function f defined [as a function from a man x who owns exactly one donkey to the unique donkey that x owns]. But how does the listener know this time that such a function is well-defined for the entire domain for which it is needed to ensure a determinate truth value for the sentence, i. e. that it is well-defined for the whole extension of the *N' man that owns a donkey* ? (Heim 1990, p. 141–2)

According to this explanation, a speaker may raise to salience the pronoun *it*—which can be represented by the function f—in sentence (21) by her previous utterance of the N' restriction of the determiner *every*. When the restriction implies uniqueness like, for example, in *man that owns exactly one donkey* the utterance of the restriction seems to make naturally salient just one value in the range. That is to say, the resulting function is naturally single-valued. By contrast, since the restriction *man that owns a donkey* does not necessarily imply uniqueness, its utterance cannot make salient a single-valued and thereby well-defined function. The reason is that if there are individuals in the extension determined by the N' restriction who own more than one donkey, then no particular value in the range of the function can be assigned to those individuals. As a semantic fact however the anaphoric linkage should constrain "the function that interprets the E-type pronoun, by determining its range" (Chierchia 1992, p.158). The range, in such a case, should be provided by the head of the NP coindexed with the pronoun.[23]

The following principle sums up the explanation above:

(FuC) (c): $f(x)$ is a function whose domain is the N' restriction of the determiner of the sentence and whose range is the head of the NP coindexed with the pronoun.

The problem discussed by Heim can thus be stated by means of the following question: how can we make sure that for each argument in the domain of the function (the N' restriction of the determiner) there will be one value in its range (the head of the NP), and, therefore, that the function will not be undefined?

Two solutions to this problem, both pragmatically motivated, have been articulated by the functional approaches. The first one, argued by Heim (1990), resorts to ***accommodation*** of presuppositional information. The second one assumes that contextual factors affect the character of the function itself, which becomes then a ***choice function***. As the relation accommodation/donkey anaphora will be examined in the following chapter, here we will concentrate on the second answer (yet it is worth stressing here that both conceptions are naturally connected)

Before delving into the different choice function conceptions let us introduce a couple of formal definitions taken from set-theory. Choice functions are a direct consequence

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[23]These formulations are evidently simplifications, as Chierchia emphasises; see Chierchia (1992, p.159, n.35).

of the so-called Axiom of Choice. This axiom states that if A is a set of nonempty sets then there exists a choice function of A. Thus, a choice function is a function f with (a presumably finite) domain A and $f(X) \in X$ for each $X \in A$. The function f, then,'chooses' an element in each $X \in A$, namely $f(X)$.[24] As is well known, the Axiom of Choice cannot be proved or disproved from set theory axiomatization, since basically it is an existential postulate of that theory.[25] In other words, it asserts the existence of a set—the set defined by the choice function—without necessarily characterizing it as the extension of some previously specified property.[26] Now, this choice function conception offers an attractive solution, from a formal standpoint, to the crucial problem indicated above, i.e. how we are to select a proper value in the range of the function while preserving the non-uniqueness interpretation of the donkey pronoun.

Chierchia (1992) endorses the choice function conception with the following general argument.

> [I]n some obvious sense, the sheer utterance of a sentence like [(21)] does make a donkey-valued function salient But it won't be a function that maps each man into *the* donkey he owns. It will have to be a function that maps each man into ***one*** of the donkeys he owns. It will be thus, a choice-function. And, consequently, it won't be in general unique. (Chierchia 1992, p.160)

This, yet general, argument suggests adding the following general constraint to (**FuC**):

(**FuC**) (d): If uniqueness presuppositions are not present, $f(x)$ is a choice function .

The question now is to know whether and how functional conceptions satisfying (**FuC**),

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[24] See Partee, ter Meulen and Wall (1993) and Machover (1996).

[25] As Machover points out, the Axiom of Choice cannot be considered as a special case of the Comprehension Principle or other principles belonging to standard axiomatic set theory. And, in this respect, the Axiom of Choice "is markedly different from all other existential postulates of set theory" (Machover 1996, p.78).

[26] See Machover (1996, pp. 78-9) and Suppes (1972, pp. 239-40).

i.e. (a)+(b)+(c)+(d), can provide the range of readings that donkey sentences are supposed to exhibit.

Here is a first alternative. Gawron, Nerbonne and Peters (1991) and Chierchia (1992) share similar views about how to satisfy (**FuC**) and generate the relevant range of readings. According to them the common basis of both approaches is the role that choice functions play in generating the relevant readings. The idea here is that context "will make salient not just one [choice] function but a ***family of functions***, all of which are a priori good candidates for interpreting" (Chierchia 1992, p.160; my emphasis). Thus, owning more than one donkey in the context of sentence (21) means that a man must be in a mapping-relation with ***each donkey in particular*** that he owns. Therefore, the conception of a donkey pronoun as denoting a family of choice functions provides immediately the U-reading of sentences like (21), because all donkeys will be captured by some choice function interpreting the pronoun *it*, no matter what amount of them a man owns. Furthermore, it is patent that no direct resort to uniqueness is needed. Whereas, under this conception, a man can own more than one donkey as his relation to each of his donkeys is assured by the character of the function, each assignment of him as an argument will yield one value in the range. This suggests that the following specification of (d) above might be added to (**FuC**).

(**FuC**) (e): E-type pronouns constitute a family of equally salient choice functions $\boldsymbol{f}(x)$.

Unfortunately, as we saw in Chapter Four, Section 4.2.2, Chierchia's functional view is potentially questionable. Also, our criticism we believe will affect inevitably the plausibility of any conception based on similar premisses, for example, Gawron, Nerbonne and Peters' approach cited above. Thus, we propose discarding, without further analysis, conceptions supporting requirement (e) above[27]. That is to say, conceptions

[27] Apart from methodological considerations, according to Kanazawa (1993, p. 157), the deficiency shared by both approaches has a logical angle too: the absence of an appropriate treatment and definition of monotone increasing determiners.

supporting (**FuC**) (a)+(b)+(c)+(d)+(e).

In what comes we are going to look at a different alternative that, respecting constraints (a), (b), (c) and (d), provides a more apt answer to the problem of generating the readings of a donkey sentence.

5.3 The Functional Generalized Quantifier Analysis

The treatment of donkey anaphora we are going to introduce in this section is based on Generalized Quantifier theory (***GQ*** henceforth) and has been developed mainly by Lappin (1989) and Lappin and Francez (1994). Some basic aspects of the approach in question will be examined first. These aspects of ***GQ*** are (a) its commitment to an E-type view of pronouns and (b) its functional treatment of E-type pronouns.

On the other hand, at this initial stage no appeal to choice functions will be made. As we shall see, however, ***GQ*** departs immediately from previous functional conceptions as regards the nature of the individual values supposedly assigned to donkey functions. At a second stage, choice functions are systematically introduced. Henceforth we will call this functional account based on GQ theory, the Functional GQ theory, or simply, ***FGQ***.

The basic framework of GQ is that formulated in Barwise and Cooper (1981) and Cooper (1983). A well-known characteristic of this framework is its treatment of NPs that denote set of sets. Roughly speaking, for any NP [Det N'], the set it denotes will contain all and only the sets which are related to the set denoted by its N' and satisfy the condition imposed by its determiner Det. Thus, a sentence of the form [NP VP] is true iff the set that is the extension of the VP is included in the set of sets denoted by the subject NP. Thus we get, for instance, the representations in (22'), (23') and (24') for (22), (23) and (24) respectively (**E** corresponds to the domain of entities, **S** and **P** to sets of individuals who sing and are philosophers, respectively, and **X** to a set of sets in **E**).

(22) Every philosopher sings.
(23) Some philosopher sings.
(24) No philosopher sings
(22') $\mathbf{S} \in \{ \mathbf{X} \subseteq \mathbf{E}\colon\ \mathbf{P} \subseteq \mathbf{X} \}$
(23') $\mathbf{S} \in \{ \mathbf{X} \subseteq \mathbf{E}\colon\ \mathbf{X} \cap \mathbf{P} \neq \varnothing \}$
(24') $\mathbf{S} \in \{ \mathbf{X} \subseteq \mathbf{E}\colon\ \mathbf{X} \cap \mathbf{P} = \varnothing \}$

Although an exhaustive discussion of the grounds of ***GQ*** would fall beyond the scope of the present investigation, we are already in a position to ask for applications of ***GQ*** to the donkey anaphora problem. Lappin (1989) and Lappin and Francez (1994) are recognized as the best applications of such a theory to the problem in question. According to these approaches, the GQ view will compositionally represent the interpretation of the standard donkey sentence (25) by means of (26) and (27) below (numbers are not directly represented as predicates of sets here but as expressing cardinality parameters over sets).

(25) Every man who owns three$_1$ donkeys beats them$_1$.
(26) $\|$ every man who owns three donkeys $\|$ $= \{ X \subseteq E : (\text{Men} \cap \{ a\colon | \{b : \text{own}(a,b) \} \cap \text{Donkeys} \ | \geq 3 \}) \subseteq X \}$[28]
(27) $\|$ beat them $\|$ $= \{ \text{w}\colon <\text{w}, \{ X \subseteq E\colon e_1 \ \& \ldots . \ \& \ e_k \in X \} > \ \in \{\langle \text{c}, \text{NP} \rangle : \{d : \text{beats}(\text{c}, d) \} \in \text{NP} \}\}$

Sentence (26) represents the subject NP of (25) and sentence (27) the matrix VP containing the plural pronoun *them*. That pronoun comes out in (27) as an E-type pronoun (represented by the elements e_1 & .... & e_k of X that belong to the set of ordered pairs ⟨c, NP⟩) that, for each man a, denotes the elements of the intersective set specified in the right-hand side of (26), i.e. the set of at least three donkeys that a owns.[29] This representation helps us to see how important the intersective set is for determining the content of the E-type pronoun in (25). Lappin and Francez offer the following explanation

[28] We are assuming here that $|X|$ corresponds to the cardinality of the set X and that *own* (a, b) is an abbreviation for the set of ordered pairs $<a, b>$ which belongs to the set *Own*, i.e. such that a owns b.

[29] For any u which is an element of the set in question the intersective set is defined as
(i) $\{ b : \text{own}(u, b) \} \cap \text{Donkeys}$

of the representation (27):

> [W]e can represent the interpretation of *them* relative to its antecedent [*three*] *donkeys* in [(25)] by an appropriately defined set of individual terms whose denotations are not assigned independently, but are dependent upon other individuals. In effect, each such term denotes a function from individuals to individuals (Lappin and Francez 1994, p. 395) [30]

If the sequence e_1 ..... e_k $(1 \leq k)$ denotes the set of individual terms such that for each individual u which belongs to the intersective set of men who own at least three donkeys, e_i is one of the at least three donkeys which u owns,[31] then e_i can be represented as a function $f_i(u)$. This function is such that for each appropriate u, $f_i(u) \in (\{ b\text{: own}(u, b)\} \cap \text{Donkeys})$, and $f_i(u) \neq f_j(u)$. This way the interpretation of the VP *beat* in (27) is given by the set-theoretical representation (28) below, when the interpretation of the subject NP of (25) is applied to that VP. Therefore, the interpretation of the whole sentence can be specified finally by means of the equivalence in (29).

(28) $\{\text{c: beats}(\text{c}, e_1) \,\&\, ... \,\&\, \text{beats}(\text{c}, e_k)\}$

(29) $\|$ Every man who owns three donkeys beats them $\|$ = true iff

$$(\text{Men} \cap \{a : |\,\{\text{b: own}(a, \text{b})\} \cap \text{Donkeys}\,| \geq 3\}) \subseteq \{\text{c: beats}(\text{c}, e_1) \,\&\, ... \,...\, \&\, \text{beats}(\text{c}, e_3)\}$$

Sentence (29) says that (25) is true iff every man who owns at least three donkeys beats each of the donkeys in the intersective set of at least three donkeys that he owns, which is the correct E-type interpretation of the sentence. As a result, the interpretation of the paradigm donkey sentence in the left hand side of (30) below becomes unproblematic. The standard U-reading in the right hand side of (30) is obtained by making the obvious change in the cardinality parameter of (26).

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[30] See also Lappin (1989, pp. 278-279).

[31] $\{e_1 \,....\, e_k\} = (\{b\text{: own}(u, b)\} \cap \text{Donkeys})$

(30) $\|$ Every man who owns a donkey beats it $\|$ = true iff

$$(\text{Men} \cap \{a: \{b : \text{own}\,(a, b)\} \cap \text{Donkeys} \neq \varnothing\}) \subseteq \{\text{c: beats(c}, e_1) \ \& \ ... \ ... \ \& \ \text{beats(c}, e_k)\}$$

(30) provides indeed the required E-type interpretation, namely that every man who owns a donkey beats every donkey he owns. Moreover, in the GQ functional theory E-type pronouns, in accordance with Neale's numberless hypothesis (NH), become semantically unspecified for grammatical number. In the present proposal, the grammatical number of a donkey pronoun is determined by the ***cardinality bounds*** of its antecedent, i.e. by "the minimal cardinality bound (upper or lower) associated with the determiner of its antecedent NP" (Lappin and Francez 1994, p.396).[32] Because both in (29) and (30) the lower cardinality bounds are three and one respectively, we get in the first case a grammatically plural pronoun, and, in the second, a singular one. The functions denoted by the E-type pronouns can, accordingly, be interpreted as mapping individuals to ***maximal collections*** of individuals. Thus, the interpretation is subject to a maximality constraint, which is specified by the cardinality bounds of the plurality parameter of the intersective set. If for instance the cardinality parameter is *at least one F*, the grammatical number of the pronoun must match the lower cardinality bound of the intersective set. The pronoun *it* satisfies this constraint. Now if the cardinality parameter specifies *at most three Fs*, the pronoun must match the upper cardinality bound of the intersective set. This is satisfied, for instance, by the pronoun *them*. By contrast, "the cardinality of the intersective set in terms of which [the] denotation [of the pronoun] is defined need not match [the grammatical] number [of the pronoun]." (Lappin 1989, p.282). Thus whereas the pronoun *it* is singular, its intersective set can contain more than one element, and although the pronoun *them* is plural, its intersective set can contain only one element. Therefore, the maximality constraint provides an immediate numberless effect on the pronoun.

Here we pause to note two initial differences between FGQ and other approaches to

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[32] See also Lappin (1989, p.282).

donkey anaphora. The first concerns the value of the function and is rather ontological in nature. It is that while in FGQ functions are defined and used as usual, their values are additionally restricted due to their belonging to a maximal collection. In other words, according to FGQ the values in the collection must be structurally similar and thereby ontologically undistinguishable from one another. This characteristic helps us thus to block any underlying argument in favour of the uniqueness of the donkey pronoun. The second difference lies in the use of plurality parameters in processing the domain of the donkey function, in particular in specifying the parameter of collective reading (i.e. $+Coll(X)$). As we shall see, this initial invocation to plurality aspects will become crucial at the second stage of the theory.

Consequently, at the first stage of development of FGQ the following constraint can be inferred:

(**FuC**) (f): E- or D- type pronouns denote a function $f(x)$ from individuals
to maximal collections of individuals.

Even though the FGQ conception depicted by (**FuC**)(f) promises a solution to the limitations found in the previous functional theories, it is clear that, in its initial formulation, the approach does not go very far. In the present GQ theory we are able to explain only the standard readings of donkey sentences. The various complex examples discussed in the previous chapters remain nonetheless beyond its reach. Therefore, it seems necessary to extend FGQ so as to make it apt to deal with such examples. This implies that the constraint (**FuC**)(f) must be further specified. Thus, this brings us to the second stage of implementation of the theory in question.

FGQ implements (**FuC**)(f) by dint of the following two claims due to Lappin and Francez (1994):

(f1): Maximal collections are ***sums of individuals*** or ***i-sums***.

(f2): Given an E-type function , f must satisfy the following maximality constraint:
for each argument x for which f(x) is defined, the function selects the supremum in the set of i-sums in its range.

Condition (f1) can be spelt out in the following terms. The notion of **i**-sum derives from Link (1983, 1987). According to Link **i**-sums are formed by a particular operation $\vee_i$ on a domain E of atomic individuals. An **i**-sum term can be, for instance, '$a \vee_i b$' where a and b are atomic individuals. '$a \vee_i b$', in Link's words, "is supposed to denote a new entity in the domain of individuals which is made up from the two individuals denoted by a and b" (Link 1987, p. 151). Such an **i**-sum does not denote the set consisting of the values of a and b "but rather another individual of the same kind as [the value of a and b]" (Link 1987, Ibid.). As a result, the ordered pair ⟨E, $\boxed{\vee}$⟩ determines a semi-lattice algebra that contains atomic individuals and **i**-sums constructed from these individuals. E is closed under the $\vee_i$ operation. This operation induces, in its turn, a partial order $\leq_i$ on E corresponding to the relation between the elements of E and the **i**-sums of which they are parts. We can call these parts, **i**-parts[33]. In Link's system we have finally predicates constructed from standard one-place predicates like $\|F\|$, which denote the set of all **i**-sums that are in the extension of $\|F\|$ in E. Characteristically, Link symbolizes those predicates as '*F'.[34] '*F' is, intuitively speaking, a pluralized predicate that adds (sets of) i-sums to the extension of F. This basic explanation should help us to understand how Lappin and Francez conceive formally an E-type pronoun when these authors treat the latter as denoting a maximal collection. It is not difficult envisage the ontological significance of these modifications. In short, in the GQ analysis E-type pronouns do denote individuals but of a special sort. In particular since the denotation of donkey pronouns corresponds to collections of **i**-sums, its structure differs markedly from that of a basic set of individuals.[35]

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[33] Group expressions like *committee* do not have **i**-parts in Link's semantics. They are atoms in E; see Link (1987, Ibid)

[34] Our exposition is obviously very simplified; for more detail see Link (1983, 1987) and Landman (1989, 1996).

[35] See Link (1987, p.151) for a philosophical rationale for **i**-sums.

Let us consider how Lappin and Francez understand (f2). Let I be a set of **i**-sums. Then the supremum of the set I is the smallest $j \in I$ (the least upper bound) such that every $i \in I$ is a part of j.[36] Therefore, E-type pronouns understood as functions whose range is I select the smallest **i**-sum in I such that every other **i**-sum is a member of it. Also given the presence of pluralized predicates in Link's system, Lappin and Francez represent numerical determiners as one-place predicates on sets. With these elementary explanations in place, we can examine Lappin and Francez's construction of the representations of standard donkey sentences. Consider again the paradigm sentence (31) below (antecedent and pronoun go coindexed).

(31) Every man who owns *a donkey*$_1$ beats *it*$_1$.

The predicate *owns* can now be understood as a pluralized relational predicate **owns*, which applies to the elements of the set defined by the one-place predicate **1**_*donkey*, i.e. the set of **i**-sums of donkeys with a cardinality of at least one. Thus, the interpretation of (31) can be captured by means of (32) below (*beat* is interpreted in the latter as a pluralized relational predicate)[37].

(32) $(\text{Men} \cap \{a : \{b : {}^{*}owns(a, b)\} \cap \mathbf{1}\_donkey \neq \emptyset\}) \subseteq \{c : {}^{*}beats(c, \boldsymbol{f}(c))\}$

According to (32), (31) is true iff everyone who owns a **i**-sum of at least one donkey beats the entity which is the **i**-sum value of $\boldsymbol{f}$(c). On the one hand, c denotes an atomic individual in E that is a man who owns an **i**-sum of at least one donkey. On the other

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[36] According to Partee, ter Meulen and Wall (1993, p.276), "[i]n an arbitrary [power set] A we define an upper bound of $B \subseteq A$ as an element $a \in A$, if it exists, such that for all $b \in B$, $b \leq a$. An upper bound a of B is *the least upper bound of B* [...] or *the supremum of B* [...] if, for any upper bound c of B, we have $a \leq c$"; for more detail see Grätzer (1971).

[37] In order to make sure that under distributive readings of relational predicates atomic **i**-parts of **i**-sums are the denotations proper of the object NP of the sentence, Lappin and Francez formulate the following condition: let 'x $^{\circ}\prod$ y' represent the relation in which x is an atomic part of the i-sum y. Then we can specify the following condition on the distributive readings of the relational predicates

If $^{*}R$ receives a distributive reading, then (a) $^{*}R(a,b) \equiv \forall c(c\ ^{\circ}\prod b)\ R(a,c)$, and (b) $\neg\ ^{*}R(a,b) \equiv \forall c(c\ ^{\circ}\prod b)\ \neg R(a,c)$.

hand, the supremum in the set of **i**-sums in the intersective set of (31) is the maximal **i**-sum of at least one donkey that c owns. Hence if the maximality constraint in (f2) is applied to f(c), sentence (31) is true iff every man who owns at least one donkey beats the maximal **i**-sum of at least one donkey which he owns. In other words, (32) implies that every man who owns at least one donkey beats every donkey that he owns, which corresponds to the standard U-reading associated with (31).[38]

Two natural questions to ask at this stage are whether or not FGQ can make room to choice functions and, if so, how. Lappin and Francez answer the first question positively and their answer serves, in turn, as an answer to the second question. In short, Lappin and Francez maintain that if we cancel the maximality constraint in (f2), f(x) becomes a choice function. Cancelling the maximality constraint is prompted by pragmatic considerations associated mainly with the lexical content of the VP present in the donkey sentence. Consequently, in FGQ a donkey function must be sensitive not just to the determiner of the N' restriction but also to other features of the sentence that interact with context and pragmatic information.[39] If the maximality constraint in (f2) is suspended or cancelled, the function maps then individuals to just ***one*** of the **i**-sums in its range. We shall henceforth symbolize the cancellation and the application of such a maximality constraint as '^{-}f(x)' and as '^{+}f(x)' respectively. Let us now consider sentence (33), where the preferred reading is the E- one.

(33) Every person who had *a dime*$_1$ in his pocket put *it*$_1$ into the meter.

Since under the E-reading this sentence (or more exactly the content of its VP) does not require that every dime be put into the meter, maximality can be suspended. Therefore, the correct semantic representation of (33) comes out in (34).

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[38] See Lappin and Francez (1994, pp.403 ff.).

[39] This implies that Lappin and Francez's view is not committed to any a priori constraint concerning the determination of the choice function.

(34) (Person $\cap$ $\{a\text{: } \{b : {*}has\_in\_his\_pocket(a,b)\} \cap \mathbf{1}\_dime \neq \emptyset\}$) $\subseteq$
$\subseteq$ { c: *put_into_the_meter(c, -ƒ(c)) }

In this case, -ƒ(c) is a choice function that, for a person c who has in his pocket an **i**-sum of dimes with cardinality of at least 1, yields one of the **i**-sums of dimes with a cardinality of at least 1 as the value of the function. If the maximality constraint in (f1) is applied to ƒ(c) we get $^{+}$ƒ(c), i.e. we get a function whose **i**-sum is the supremum containing all of the dimes in c's pocket. Since, according to Lappin and Francez, "when the maximality condition on ƒ(c) is suspended, a donkey sentence is true iff there is at least one choice function ƒ(c) for which the specification of its truth conditions holds" (Lappin and Francez 1994, p.406), (34) provides the correct reading of (33), namely the E-reading. Therefore, whenever such a constraint is not applied—i.e. whenever we get a choice function—the E-reading is the representation available .

Asked as to the pragmatic considerations determining the suspension of the maximality constraint, Lappin and Francez answer that such considerations have to do with "implied cardinality restrictions [of the VP] on the size of the **i**-sum which can serve as the value of [...] the pronoun. This implied restriction is pragmatically based and involves real world knowledge" (Lappin and Francez 1994, p. 407). In order to see how and when these considerations apply, let us consider the following sentences.

(35) Every person who has *a credit card*$_1$ pays his bill with *it*$_1$.
(36) Every person who has *a credit card*$_1$ pays a service charge for *it*$_1$.

Pragmatic considerations and real world knowledge related to the VP in (35) determine that a person uses often one credit card to pay a particular bill. In this case, the cardinality restriction forces the selection of an **i**-sum (with cardinality of one) from the range of the function. An E-reading is thereby obtained. Moreover, the **i**-sum concerned should be considered as ***nonmaximal***, since the same pragmatic assumptions determine that other **i**-sums with the same cardinality can serve as values of the function. By contrast, in the case (34) there seems to be no 'pragmatically salient limit' to the number of credits cards that a person pays service on, and thereby no restriction on the size of the **i**-sum in question can be imposed. Thus, in this latter case the functions that denote donkey pronouns are subject to the maximality condition. Accordingly, the U-reading—the preferred one—is obtained.

We can now formulate the following final specification of (**FuC**) (f), which encapsulates our above explanations:

(**FuC**) (f3):If, due to pragmatic considerations on the cardinality of the **i**-sum, the maximality constraint in (f2) is cancelled, $f(x)$ selects just one (nonmaximal) **i**-sum in its range, i.e. $f(x)$ becomes a choice function.

According to Lappin and Francez, (f3) suggests an additional generalisation affecting the distribution of the U- and E-readings. They argue that, granted that cardinality restrictions are introduced by pragmatics and contextual knowledge, the maximality condition is, in principle, always available. Hence the U-reading is always in place and becomes, in Lappin and Francez's terminology, the 'default interpretation' of donkey sentences. Evidence in favour of this generalisation, they affirm, comes from sentences like (36) above and (37)–(38) below. In these sentences the cardinality restriction associated with the size of the **i**-sum is cancelled by means of the introduction of a monotone decreasing determiner in both the subject NP and the negation of the VP, respectively.

(37) No person who had *a dime*$_1$ in his pocket put *it*$_1$ into the meter.
(38) Every person who had *a dime*$_1$ in his pocket did not put *it*$_1$ into the meter.

Consider (37). On reflection, the reading associated with this sentence is the one formulated in (39).

(39) Every person who had a dime in his pocket put no dime he/she had into the meter.

Thus, the presence of the monotone decreasing determiner in (37) has the effect of negating the relation denoted by the VP and thereby of cancelling the cardinality restriction implied by the non-negated counterpart of the sentence. Sentence (37) implies that there is no "pragmatically salient limit on the number of objects which one does not put in a meter at a particular time" (Lappin and Francez 1994, p.408). FGQ predicts clearly this situation. The representation (40) that FGQ generates for (39) specifies this prediction.

(40) (Persons $\cap$ { ***a*** : { ***b*** : ****has_in_his_pocket*(a, b)*** } $\cap$ **1*_dime*** $\neq \emptyset$ }) $\subseteq$
$\subseteq$ {*c*: $\neg$ ****put_in_the_meter*(c,*** *-f*(*c*)) }

Structure (40) corresponds to the U-reading of sentence (39), which, according to Lappin and Francez, becomes the default reading of the latter[40].

We need to consider finally how FGQ deals with the complex cases of sage plant sentences, where Neale's distributivity analysis as well as other proposals fail. Let us examine again the standard example in sentence (41) below, discussed in Chapter Three. As we said there, the truth of that sentence requires that each person who bought at least two sage plants bought a total of at least seven sage plants.

(41) Every person who bought *two sage plants*$_1$ here bought five others along with *them*$_1$.

Because of its collective basis, FGQ appears to be made for dealing with this sort of sentence. If we assume that the matrix VP in (41) is interpreted collectively with respect to the E-type pronoun *them*, then cardinality restrictions must be present in the **i**-sums

[40] For more detail on the rationale of Lappin and Francez's distribution criterion see Lappin and Francez (1994, p. 408 ff.).Verbs like *refuse* or *failed* are also explained by means of cancellation of cardinality restrictions, because these verbs suppose the negation of the matrix VP. Obviously, if we do not want to represent the meaning of (37) by quantifying over choice functions, a natural alternative is to use a dynamic construal. For instance, Chierchia (1992) suggests the following analysis of sentence (39):

(i) λp($\forall$x[[person(x) & $\exists$y[dime(y) & has_in_his_pocket (x, y)]] $\rightarrow$ $\neg$y[dime(y) & has_in_his_pocket (x,y) & put_in_the_meter (x,y)]] & $\check{}$p] assigned as values to the pronoun.[41] So, as cancellation of the maximality constraint is inevitable, we end up with a choice function representing the pronoun. This means that a structure such as (42) below can be constructed for (41). The natural language interpretation of (42) is specified in sentence (43).

(42) $(\text{Persons} \cap \{a\colon \{b\colon {}^{*}\textit{bought}\,(a, b)\} \cap \mathbf{2}\_\textit{sage-plants} \neq \varnothing\ \}) \subseteq$
$\subseteq \{ \text{c} : {}^{*}\boldsymbol{bought\_5\_others\_along\_with}\ (\text{c}, \text{-}f(\text{c}))\}$

(43) Every person who bought at least two sage plants here bought five others along with the at least two sage plants bought by him/her.

Since the pronoun *them* in (39) can be understood as specifying a choice function, this function will select an arbitrary non maximal **i**-sum *b* of sage plants with a cardinality of at least 2. Thus, this interpretation of the donkey pronoun plus the interpretation associated with the pluralized predicate ***bought_5_others_along_with*** provide the correct E-reading of the pronoun and satisfy the truth-conditions of (41) specified in (43).

The previous result contradicts Neale's opinion (see Chapter Three, Section 3.2) in that the collective reading is, in certain cases, the only available interpretation for E-type pronouns. Consequently, it seems an inescapable conclusion that the semantics of those pronouns must be constructed taking into account collectivity aspects. Moreover, the functional approach shows that, even in the simple cases of sage plant sentences, distributive views like Neale's may be seriously limited. For if, as Lappin and Francez contend, sage plant sentences are singular—i.e. if they contain singular indefinite NPs as the antecedents of the E-type pronouns—their VP is interpretable as inducing either a collective or distributive readings of the pronouns. Both readings, in this case, are equivalent. Hence they provide, for the distributive reading of sentence (44) below, the specification in (45).

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[41] Lappin and Francez argue that cardinality restrictions attached to VPs and induced by numerical determiners do not derive from pragmatic assumptions but only from the lexical content of the VP; see Lappin and Francez (1994, p. 414).

(44) Everyone who bought *a sage plant*$_1$ here bought five others along with *it*$_1$.

(45) For each person x who bought an **i**-sum of sage plants here with a cardinality of at least 1, for each atomic part y of the maximal **i**-sum a of sage plants with a cardinality of at least 1 such that x bought a here, there is an **i**-sum z of at least five sage plants such that x bought z here and no atomic part of z is identical to y.

It should be clear that (45) represents the U-reading of (44), because the VP *bought five others along with it* is interpreted there distributively. In other words, each atomic part of the maximal **i**-sum a that stands for *a sage plant* is related to each atomic part of the non maximal **i**-sum z which stands for *five others plants*. Also, this shows, in accordance with Lappin and Francez's suggestion, that the VP need not be constrained by a cardinality restriction. However, the VP of (44) is also interpretable collectively. The same cardinality restriction holding for (41) applies to this case as well. The following is the reading in question.

(46) For each person x who bought an **i**-sum of sage plants here with a cardinality of at least 1, there is a non-maximal **i**-sum of sage plants y with a cardinality of at least 1 such that $x$bought y here, and there is an **i**-sum z of at least five sage plants such that x bought z here and no atomic part of z is an atomic part of y.

Apparently, (46) also allows for E-readings of (44) as the **i**-sum y of sage plants with cardinality of at least 1 is non-maximal. However, as Lappin and Francez point out, (44) can be shown to be equivalent to (45). From that, these authors conclude that the interpretations (45) and (46) generated "on the distributive and collective readings of [the] VP [of (44),] are equivalent and correct" (Lappin and Francez 1994, p. 415). This proves that there is no necessity of assuming any particular commitment to distributivity in interpreting donkey sentences (contradicting again Neale's suggestions). On the contrary, the FGQ treatment of donkey anaphora makes it clear that actual decisions about plurality aspects in donkey sentences are closely related to the interpretation of their VPs, which unavoidably triggers interaction with contextual knowledge. It follows therefore that the representation of such sentences and their E-type pronouns should be systematically sensitive to those aspects.

5. 4 FGQ and Donkey Anaphora Nonspecificity: the Semantic Evaluation and the Pragmatic Evaluation

5.4.1 The semantic evaluation

In this section, we will evaluate FGQ in terms of our previous discussion on the functional conception of semantic nonspecificity. We argue that FGQ provides a satisfactory formal basis on which to implement our claims about donkey anaphora nonspecificity.

An evaluation of FGQ in terms of nonspecificity should consider at least four aspects. The first aspect concerns general adequacy and predictive and explanatory power. From our arguments in sections 5.2 and 5.3, it seems clear that a functional theory of donkey anaphora that embraces (**FuC**) (a)+(b)+(c)+(f) should be preferred. FGQ provides an elegant and successful implementation of that conception and is therefore the ideal candidate to be preferred. This implies also the acceptance at once of (f1)+(f2)+(f3). As to functional nonspecificity of donkey sentences however the only assumptions that should be taken into account are, in our opinion, (a), (b), (c), and (f3). Requirements (a), (b) and (c) are already adequately justified. Later in this section we shall substantiate our option for (f3).

The second aspect to be considered in evaluating FGQ is crucial to us here. It concerns the potential availability of the different readings of a donkey sentence. Although Lappin and Francez do not make any explicit claim in favour of a nonspecificity analysis, their proposal is we think basically compatible with this analysis. Our opinion is based on their own evaluation of FGQ and the theoretical tenets supporting it. After implementing (f3) and showing that the GQ account parametrically generates the E- and U-readings, Lappin and Francez state the following conclusion:

> Our **i**-sum based E-type account has achieved the objective which we adopted [...] for an adequate theory of donkey anaphora. It generates both the universal and the existential readings of donkey sentences from a single representation through the assignment of distinct values to a parameterized feature of these representations[...]. In principle, both readings are available for any donkey sentence.(Lappin and Francez 1994, p.406)

Whatever the weight this conclusion may have within Lappin and Francez's theory, it involves a claim compatible with our initial characterization of functional or parametric nonspecificity. We can call this claim the ***availability-in-principle assumption***. The claim imposes some interesting constraints on functional theories of donkey anaphora. Here we indicate three of them. First, it implies that in the representations generated by a functional theory linguistic or syntactic constraints restrict but do not fix the semantic content of the donkey sentences. Recall that we have argued in favour of this consequence in Chapter Four, Section 4.3. Evidently, because of their very nature, all of the functional theories are committed to this constraint.

Second, the availability-in-principle assumption implies a simple principle of adequacy for the semantics of donkey anaphora. This principle states that if donkey sentences are underspecified by linguistic rules, the semantics of those sentences must systematically provide their preferred as well as non-preferred readings. It follows then that the semantics must provide nonspecific schemas from which each reading of the donkey sentences are specifiable. FGQ clearly satisfies this requirement. For instance, in standard donkey sentences with the determiner *every* affecting the subject NP and numerical determiners attached to the antecedent of the pronoun, the theory in question allows us to formulate the following ***nonspecific schema***:

(nss 1) $(\boldsymbol{F} \cap \{a\colon \{b : {*}\boldsymbol{G}\ (a, b)\} \cap \boldsymbol{n\_H} \neq \varnothing\ \}) \subseteq \{\mathrm{c} : {*}\boldsymbol{K}(\mathrm{c}, {}^{+/-}\boldsymbol{f}(\mathrm{c}))\}$

Intuitively, the expression '${}^{+/-}\boldsymbol{f}(\mathrm{c})$' in (**nss 1**) corresponds to a donkey function which we do not know yet whether or not the maximality constraint will apply to. One can decide this, as we now know, only after the utterance of the donkey sentence interacts with contextual information. Thus, (**nss 1**) renders in principle available any specification of the donkey function resulting from processing contextual information. Similarly for donkey sentences with negative monotone determiners (for instance, *no*) attached to the subject NP, one can derive from FGQ the following nonspecific schema.

(**nss 2**) $(\boldsymbol{F} \cap \{a: \{b: {}^*\boldsymbol{G}(a, b)\} \cap \boldsymbol{n\_H} \neq \varnothing\}) \cap \{c: {}^*\boldsymbol{K}(c, {}^{+/-}f(c))\} = \varnothing$

Third, in a functional theory the availability-in-principle assumption implies that specific readings of a donkey sentence obtain as a consequence of processing certain parameters in the functional representation of the pronoun. Because FGQ considers donkey pronouns as functions whose values are parametrically determined, this constraint is immediately satisfied. It is worthwhile in this connection indicating the parametric features that determine the value of the function in (**nss 1**). The first feature is the cardinality *n* of the predicate *H*. The second feature is supplied by the pluralized predicate **K*, whose processing helps us to determine whether or not the **i**-sum denoted by the value of the function must be interpreted as a maximal collection. In other words, **K* helps us to determine a third parameter, the maximality operator '±'. Finally, as Lappin and Francez's theory dictates that, in donkey sentences containing plural indefinite NPs, interpretation of VPs is the only responsible for the determination of which plural feature is selected, specification of the maximality operator depends to a certain extent on that interpretation as well[42]. This implies that the interpretation of the VPs as either $+Coll({}^*K)$ or $-Coll({}^*K)$ (i.e. as meaning collectivity or distributivity) helps us to specify the maximality operator with '-' or '+', respectively. Thus, ideally parameterized specifications of (**nss 1**) such as those in (**ss 1**) and (**ss 2**) below can be derived. Schema (**ss 1**) represents the specification of a standard donkey sentence with the numerical determiner *three* affecting the antecedent of the pronoun; schema (**ss 2**) represents the parallel case with the negative monotone determiner *no* affecting the subject NP.

[42]Here Lappin and Francez assume one of the possible explanations of the different interpretations of plural sentences. Our claims about nonspecificity do not not necessarily commit us to their analysis.

$$(\textbf{ss 1})\ (\boldsymbol{F} \cap \{a{:}\ \{b{:}\ {*}\boldsymbol{G}(a, b)\} \cap \mathbf{3\_}\boldsymbol{H} \neq \varnothing\ \}) \subseteq \{c{:} +Coll({*}\boldsymbol{K}(c,-f(c)))\}$$

$$(\textbf{ss 2})\ (\boldsymbol{F} \cap \{a{:}\ \{b : {*}\boldsymbol{G}\ (a, b)\} \cap \mathbf{3\_}\boldsymbol{H} \neq \varnothing\ \}) \cap \{c{:} +Coll({*}\boldsymbol{K}(c,-f(c)))\} = \varnothing$$

More tentatively, schema (**ss 3**) suggests the representation of the specification of a simple sage plant case.

$$(\textbf{ss 3})\ (\boldsymbol{F} \cap \{a{:}\ \{b{:}\ {*}\boldsymbol{G}(a, b)\} \cap \mathbf{1\_}\boldsymbol{H} \neq \varnothing\ \}) \subseteq$$
$$\{c{:} +Coll({*}\boldsymbol{G}\mathbf{\_(3\_}\boldsymbol{H}\mathbf{)\_along\_with}), -f(c))\}.$$

The third aspect that we have to consider in evaluating FGQ relates to its pragmatic basis and scalarity. FGQ avoids any appeal to entailment (or quasi-entailment) relations among the different specifications of donkey sentences. Let us explain why. As we saw, in Lappin and Francez's theory, schemas like (**ss 1**) are generated from nonspecificic schemas like (**nss 1**). What we need to know is then whether the generation of ss schemas must be validated by certain entailment (or quasi-entailment) procedures. In other words: whether in FGQ the different donkey readings can be generated by using logic only. Examining Lappin and Francez's theory one must conclude that the generation of each specification derives mostly from non-logical features, in particular from processing of the cardinal maximality condition. And cardinal maximality is entirely induced by real world knowledge and context. Therefore, it should be clear that maximality can hardly license logical relations among the different specifications of donkey sentences.

The fourth and last aspect to be considered in evaluating the prospects of FGQ as a theory of semantic nonspecificity concerns methodology. From a methodological point of view, a theory of nonspecificity requires the semantic representations to be as simple as possible. Simplicity in linguistics can only be the result of a unified and reduced set of theoretical principles[43]. Now, decisions about different competing theories are usually taken on the basis of evaluating, among other things, their simplicity standards. As we saw in Chapter Four, Section 4.2.2, Chierchia's proposal lacked simplicity because of its unjustified combination of different principles and constraints in treating of donkey sentences. This explained why the proposal was shown to be methodologically questionable and thereby dropped. By contrast, Lappin and Francez take simplicity and unification to be acceptable desiderata that semantic representations of donkey sentences must comply with. For instance, in commenting on Chierchia's analysis they say:

> If, in fact, both kinds of donkey sentences [with E- and U-readings] are instances of the same type of anaphoric relation, then a theory which assigns a single representation to donkey sentences and derives each reading through a variation in a parameterized feature of this representation is preferable to an analysis which uses two formally incommensurate semantic structures to obtain these interpretations. (Lappin and Francez 1994, p. 400)

Hence FGQ is evidently compatible with the methodological premises supporting a nonspecificity analysis.

5.4.2 *The Pragmatic Evaluation*

Let us turn now to other more philosophical issues having to do with the functional theories and its connection to Neale's theory. Those issues involves basically examining the status of the values that donkey functions are supposed to denote. This examination will enable us to take some definite positions about the relation natural language pragmatics/donkey anaphora.

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[43] It is worth noting here that Chomsky was the first to highlight, in his early work, the significance for linguistics of having simplicity measures; see Chomsky (1957, 1965), Chomsky and Halle (1968) and especially Chomsky (1975). Although his views about simplicity have undergone subtle changes through the years as his views about linguistic theory have changed, Chomsky's conviction about the usefulness of simplicity as an adequacy criterion for linguistic theory remains unchanged; see Sober (1975) and Lyons (1991).

We held in the beginning of the previous section that any satisfactory functional theory of donkey anaphora nonspecificity should endorse the conception implied by (**FuC**) (a)+(b)+(c), plus (f) and (f3). If our previous arguments in this dissertation are basically correct, (**FuC**) (a)+(b)+(c) must be considered as necessary conditions to explain donkey anaphora nonspecificity. Thus, the question that remains is the following: why do we have to accept (f) and (f3) as necessary requirements in a functional theory of donkey anaphora? As to the necessity of condition (f), our answer put us back to the general background provided by Neale's theory. As to (f3), the answer depends on what we will say about (f). We have first to clarify what we consider being intrinsically valuable in (f). Obviously, the crucial aspect of (f) is the association of the values of a donkey function with maximal collections, as argued by Lappin and Francez. Nevertheless, it is not necessary for a theory of functional nonspecificity to endorse all theoretical assumptions behind Lappin and Francez's conception of maximal collection. On the one hand, we think a functional theory need not be committed to a conception of collections, according to which the latter must be represented by lattice-theoretical structures. Collections can well be just sets of a particular type or something else[44]. On the other hand, collections are, strictly speaking, not groups[45]. In particular, unlike groups, collections contain atoms or irreducible entities. Thus, in donkey anaphora treatments the commitment to collections can, it seems to us, be confined to the idea that donkey functions must take as values complex entities—whatever they may be—composed of atomic individuals.

Now, we can ask ourselves whether is it possible, and how, to connect this idea with the general analysis of nonspecificity deployed in Chapter Two. The answer to these two questions will allow us to show the strenght and richness of that analysis. As indicated in Chapter Two, Section 2.2, referential disambiguation of a definite description in a given utterance context does not imply, on the hearer side, an exhaustive specification of the thought associated with the object referred to. Following Bach (1987) we argued

[44] Lappin and Francez's theory permits alternative conceptions; see Lappin and Francez (1994, p. 402, n. 12).

[45] See Link (1987) and Landman (1996).

that a hearer, in processing speaker's intentions behind referential uses of descriptions, is naturally committed to the idea of 'unspecified or nonspecific reference'. In other words, referents that the speaker introduces in communicative processes by using expressions such as *the F*, and pragmatically specified by the hearer, will qualify as 'unspecified' or 'nonspecific' objects.

We consider Bach's claim about nonspecific reference a useful clarification about how speakers communicate object-dependent thoughts by means of definite descriptions. While some semanticists could resist Bach's claim on philosophical or linguistic grounds, we believe that its acceptance or rejection should mostly depend on its capacity to interact with some interesting semantic approaches dealing directly with reference issues. Bach's picture do have that capacity. In particular, we believe that it is clearly compatible with Neale's analysis of anaphora.[46] One reason to think that way is the fact that the semantic property of numberless (Neale's NH) is a primary example of how definite descriptions induce unspecified reference in anaphoric contexts. Maximal collections or complex individuals become natural ways of spelling out the property of numberlessness in the representation of E-type pronouns. Thus, if NH is in general a correct hypothesis, as we take it to be, the denotation of the E-type pronouns involves inevitably unspecified reference in Bach's sense. In addition, the values of the functions representing such pronouns will involve inevitably i-sums, complex individuals, nonspecific individuals or something similar.

We turn now to address the question about the maximality condition associated with the requirement (f). The question can be formulated in the following manner: why and when must i-sums denoted by the donkey functions satisfy the cardinal maximality condition? The answer to those questions depends, it seems to us, only on whether both the numberless hypothesis and the notion of unspecified reference are taken seriously. On the one hand, under NH the donkey pronoun *it*, for example, is associated with different

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[46] Bach recognizes explicitly a general agreement between his views and Neale's; see Bach (1994, *Postcript* pp. 310-1).

nonspecific individuals with cardinality of at least one. Now while pragmatic knowledge is not introduced in the function, we have to make sure that ***any*** individual in the set of the nonspecific individuals can be denoted by the function. This can only be insured by imposing maximality on the function. On the other hand, in terms of nonspecificity the application of the cardinal maximality condition means that, for reasons related to the interaction between structural factors—for instance, VPs—and contextual and real world knowledge, the values of the function are not needed of further specification. In terms of Bach's explanation one could say that whenever a donkey sentence with the maximality condition is uttered by a speaker in front of somebody, the former is intending the latter to recognize that the former intends the latter not to specify further the object-dependent thoughts associated with the utterance of such a sentence.

Finally, we are now in the position of suggesting why functional theories need to endorse the requirement (f3), namely why they need to endorse some choice function view. It should be clear by now that the choice function conception that should be retained for a satisfactory donkey anaphora theory involves simply the requirement that choice functions are activated after cancelling the maximality requirement. Thus this conception should not be committed to the idea that cardinality restrictions derive basically from VPs, as Lappin and Francez's theory takes it. Cardinal restrictions are crucial when cancelling maximality obviously, but the empirical issue of their origin, it seems to us, can remain open. Accordingly, we have to explain how this version of a donkey choice function that we are endorsing can be accommodated in our analysis of nonspecificity. We suggest the following story as a reasonable explanation: first, choice functions in that version are pragmatically motivated ways of specifying the values that the functions can assign to the E-type pronouns. Second, since the reference of those pronouns is always an individual compound and not a single individual, the specification in question cannot be exhaustive (unless a uniqueness presupposition points out the contrary). Third, the foregoing indicates that the reference in question will remain unspecified still after processing the function.

Furthermore, our explanation accords with an analysis in terms of communicative intentions. Let us briefly examine the point. The activation of a choice function means the speaker is uttering a donkey sentence with the intention that the hearer recognizes that the former intends him/her to specify one of the object-dependent thoughts associated with the utterance of that sentence. If, in uttering the donkey sentence, the speaker does not intend the hearer to entertain a uniqueness presupposition, then specification (by means of the choice function) of an object-dependent thought associated with the sentence cannot be exhaustive. In such a case, the reference of the sentence in question will in principle remain unspecified.

Finally, we take it for granted that intersentential anaphoric discourse contains many expressions operating as definite descriptions in disguise—i.e. E-type pronouns. Within the latter, the semantic number of the denoted objects is, for reasons put forward in Chapter Three, negligible when interpreting the pronoun. This introduces at once the whole issue of the nonspecific reference into the analysis of the anaphoric discourse. Therefore, we are unavoidably driven to conclude that adequate representation of that discourse will contain many mechanisms and uses related to nonspecific reference. In the next chapter, we will investigate and disclose several of those mechanisms and uses.

CHAPTER VI

RULES, REPRESENTATIONS AND CONTEXT

In this chapter we refine our proposal on nonspecificity in D-type anaphora regarding two major topics: rules for recovering pronominal content and problems of representation. In its turn, the discussion of these topics will help us to spell out how a D-type pronoun proposal based on a nonspecificity conception can deal with the relation between context and donkey anaphora. In other words, how such a proposal can generate appropriate pronominal content recovery rules that depict anaphora in donkey sentences as the result of the interaction between contextual and semantic knowledge. Furthermore, if we expand on this donkey anaphora conception across sentential boundaries, representation of the pronouns will require the introduction of a more flexible framework. The framework that we have chosen is Discourse Representation Theory (DRT). Doing so we show that, despite its binding conception of donkey pronouns, DRT is suitable enough to implement many of the intuitions that have supported our arguments in the previous chapters.

In Section 5.1 we discuss rules of recovery of pronominal content, in particular Neale's **P5** rule and Lappin and Francez's rules. In Section 5.2, as a consequence of the previous discussion, we formulate within the FGQ conception of donkey anaphora a different set of recovery rules and offer some applications. In Section 5.3 we explore problems of intersentential donkey anaphora and we define, within the framework of DRT, a new set of recovery rules .

6.1 Functional Recovery Rules Without Nonspecificity

As explained in Chapter Four, Neale's anaphora theory concentrates on accounting for donkey pronouns and the relation in which they stand to their antecedents. In order to formally capture this crucial relation Neale formulates his **P5** rule. **P5** allows us to recover directly the content of the donkey pronouns by copying material from their quantified antecedents. The content is then rendered as an 'impoverished' definite description. This description denotes everything which is part of both the restriction and the scope of the restricted quantifier in the antecedent. This way of presenting Neale's theory may, rather imprecisely, suggest that restricted quantifiers play a passive role in the recovery process. This is due to the general character of the formulation of **P5**. This rule can nonetheless be specified by clarifying the contribution that restricted quantifiers embedded in the antecedents make to the determination of the content of E-or D-type pronouns. According to Neale, every natural language quantifier can be evaluated in terms of its capacity of satisfying a ***logical maximality condition***. Consequently, the recovery of the content of a pronoun anaphorically related to a quantifier is sensitive to whether or not the quantifier satisfies this condition. Neale's formulation of the logical maximality condition is the following:

(LM) A quantifier '[Dx: Fx]' is ***maximal*** if and only if '[Dx:Fx](Gx)' entails '[every x : Fx](Gx)', for arbitrary G.

We can thus say that quantifiers like 'the F', 'each F', and 'all Fs', are logically maximal. In contrast, quantifiers like 'an F', 'some Fs', and 'one F', cannot count as logically maximal. According to Neale, given condition (LM), **P5** can be reformulated as the conjunction of the following subrules:

(P5a) If x is a pronoun that is anaphoric on, but not c-commanded, by a nonmaximal quantifier '[Dx: Fx]' that occurs in an antecedent clause '[Dx:Fx](Gx)', then x is interpreted as '[the x: Fx & Gx]'[1]

(P5b) If x is a pronoun that is anaphoric on, but not c-commanded, by a maximal quantifier '[Dx:Fx]' that occurs in an antecedent clause '[Dx:Fx](Gx)', then x is interpreted as '[the x: Fx]'.

It is easy to verify that these two rules enable us to get the same results as the ones obtained in Chapter Three by using **P5** only. Nevertheless, rules **P5a** and **P5b** are descriptively more powerful than **P5**. This can be seen by reflecting on the examples in (1) and (2) below:

(1) *The inventor of bifocals*$_1$ was a genius; *he*$_1$ ate a lot of fish.
(2) *The inventor of bifocals*$_1$ had *a nice house*$_2$; *he*$_1$ used to decorate *it*$_2$ every year.

A direct application of **P5** to the anaphora sentence in (1) provides us with the representation in (3) which can, in turn, be rephrased as in (4).

(3) [the x: inventor of bifocals x & x was a genius] (x ate a lot of fish)

(4) The inventor of bifocals who was a genius ate a lot of fish.

According to Neale, (4) does not correspond to the speaker intuition. He claims, in particular, that speakers would expect the pronoun *he* in (1) to induce a 'laziness' effect in the rephrasing, as specified in (5) below. The material recovered in the definite description of (5) is reduced to the nominal (of the N' restriction) of the antecedent, i.e. the expression *inventor of bifocals*.

(5) The inventor of bifocals ate a lot of fish.

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[1] Neale's definition of 'antecedent clause' is the following :

(Ant) The ***antecedent clause*** for a pronoun P, that is anaphoric on a quantifier Q ocurring in a sentence ϕ, is the smallest well-formed subformula of ϕ that contains Q as a constituent.

The case in sentence (6), where the antecedent sentence is more complex than the one in (1), shows the correctness of Neale's interpretation of the speaker intuition. Speakers would indeed disagree with a translation of the pronoun which uses the nominal plus the scope of the quantifier—i.e. the VP adjoined to the QNP of the antecedent sentence.

(6) The inventor of bifocals$_1$ was a genius, a maniac and a troublemaker; he$_1$ ate a lot of fish.

Given that similar arguments can be produced for the rest of maximal quantifiers, a rule which captures the relation of these quantifiers to their pronouns seems to be needed. **P5b** is the rule in question. By using this rule, the expected laziness effects are immediately obtained. Let us consider as a case in point sentence (1) above. As the determiner of the antecedent QNP (*the inventor of bifocals*) of the pronoun *he* in (1) is logically maximal, **P5b** generates the following representation for the anaphora sentence '*he* ate a lot of fish'.

(7) [the x: inventor of bifocals x](x ate a lot of fish)

Natural language rephrasing of (7) is (5) above. In contrast, the determiner of the antecedent QNP of the pronoun *it* in (2) is nonmaximal—*a F*, and thereby the **P5a** rule must be applied. As the representation of the antecedent sentence is the one in (8) we get the representation (9) below for the pronoun (we interpret the antecedent *a nice house* as inducing numberless on the pronoun, which is represented by the *whe* determiner).[2]

(8) [the x: inventor of bifocals x]([a y: nice house y] (x had y))

(9) [whe y: nice house y & x had y]

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[2] According to Neale's theory expounded in Chapter Three, the pronoun in question can be represented in two ways. This is the result of assigning different scopes to the definite descriptions that interact with other quantifiers. Thus, the definite description *the inventor of bifocals* in the antecedent sentence generates two scope assignments when it is connected for instance with the QNP *a nice house*. The scope assignment where the definite description takes wide scope is specified in (8). The narrow scope assignment for the definite description in question is specified in (i) below.

(i) [a y: nice house y] ([the x: inventor of bifocals x] (x had y))

So, by applying **P5a** to the pronoun *it* and **P5b** to the pronoun *he*, we obtain the representation shown in (10) for the anaphora sentence in (2). Sentence (11) corresponds to the intuitive rephrasing of the former.

(10) [the x: inventor of bifocals x] ([whe y: nice house y & x had y]
(x used to decorate y))

(11) The inventor of bifocals used to decorate each year the nice house that he had.

The content of rules **P5a** and **P5b** can thus be summarised in two general features: logical maximality and directness. They intuitively constrain, on the one hand, the anaphoric linkage between the antecedent and its E-type pronoun by relying on a property that the antecedent has or fails to have, namely logical maximality. On the other hand, having evaluated this property, rules **P5a** and **P5b** recover ***directly*** the descriptive content associated with the pronoun by copying material from the antecedent. Logical maximality has already been explained. We now need to explain how directness is supposed to operate in Neale's theory. The directness of the recovery process is based on (at least) the following two facts. First, in order to determine the content of the pronouns Neale's rules regard as only relevant explicit quantificational features of their antecedents. Second, pronouns anaphoric on Russellian descriptions "(typically) ha[ve] the same content as [their] antecedent[s]. If the antecedent description is elliptical or otherwise incomplete, so is the anaphora, and in exactly the same way" (Neale 1990, p.183). Since donkey pronouns are Russellian descriptions in disguise, it follows that the pronouns will possess the same explicit quantificational content as the descriptions. Hence, according to Neale, rules that recover the quantificational content of donkey pronouns from their quantified antecedents need not, in principle, resort to other factors, for instance, background or contextual factors.[3]

In Chapter Four, we advanced a reconstruction of Neale's theory in which **P5** (or some

[3] This conclusion must be weakened because, as was made clear in Chapter Four, Section 4.3, Neale explicitly recognizes that the isolation of his rules from context is a serious limitation afflicting them.

version of it) played a central role. Despite its limitations for coping with intersentential unbound anaphora, we argued in favour of retaining **P5** in the reconstruction concerned, on the basis of comparing its results with others supplied by competing accounts. The above applications of **P5a**, and **b** to pronouns anaphoric on maximal or nonmaximal quantifiers should, we believe, reinforce our initial arguments. Since FGQ provides the grounds for a functional reconstruction of E- or D-type anaphora, the question regarding how to implement **P5a**, and **b** rules in this functional setting now seems inevitable. More exactly formulated, it seems inevitable—if the general arguments for a functional reconstruction of Neale's theory are correct—to determine whether and how **P5a**, **b** can be implemented in the FGQ account of donkey anaphora. In fact, the functional approach can accept different implementations of the recovery rules and Lappin and Francez have advanced their own version of them. Therefore, in order to set up a basis for our suggestions about how to implement **P5a**, **b**, we will look first at the solution offered by Lappin and Francez to the problem of recovery rules.[4]

Before discussing Lappin and Francez's solution, let us clarify how the general problem of recovery rules is to be formulated when it comes to dealing with functional theories of anaphora. The aim in that case is basically to try and constrain the donkey function that interprets the E-type pronoun. That is to say, functional theories must stipulate particular requirements on the donkey function to the effect that its domain and range be appropriately determined. The idea is that appropriately determined ranges will facilitate the individuation the correct values of the function.[5] In the particular case of FGQ, it must explain how the domain and the range of the functions can be systematically associated—via explicit rules—with the sets or collections of **i**-sums that the theory provides, so far intuitively, for them.

Lappin and Francez admit that their proposal is not "a fully worked out treatment of the

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[4] Functional solutions (unlike GQ one) are formulated by Heim (1990) and Chierchia (1992).

[5] This general formulation of the problem is due to Chierchia (1992, p.159).

procedures involved in the identification of the function which interprets an E-type pronoun" (Lappin and Francez 1994, p. 404). Nevertheless, since we do not know of any other functional GQ approach to donkey anaphora in the literature, their solution will be taken as representing the 'official' GQ solution to the problem at hand. We acknowledge that this fact does affect the generality of our conclusions below about recovery rules within a functional framework. In short, we are not claiming that such conclusions will apply to all functional approaches to donkey anaphora.

The most remarkable aspect of Lappin and Francez's proposal is that recovery of pronominal content depends on the scope assignments to which the antecedent QNP is subject. Initially, these authors formulate their solution by means of the following rule, that we will call **GQE-Ta.**

(**GQE-Ta**) Let $f(x)$ be the function associated with a donkey pronoun whose antecedent NP is a QNP. If QNP is interpreted as within the scope of another quantified NP, QNP', the *domain* of $f(x)$ is the intersective set defined in terms of the N' restriction of Q' (the determiner of QNP'), and the *range* of the $f(x)$ is the set of the **i**-sums in the intersective set defined in terms of the N' restriction of Q (the determiner of QNP) (Lappin and Francez 1994, p. 405).

Simple inspection of the representations in the previous chapter for the standard cases of donkey anaphora shows that **GQE-Ta** yields the correct results. This can be verified, for instance, in the GQ representation (13) generated from the paradigm donkey sentence in (12).

(12) Every man who owns a donkey_1 beats it_1.

(13) $(\text{Men} \cap \{ a : \{ b : {}^{*}owns(a, b)\} \cap \mathbf{1}\_donkey \neq \emptyset \}) \subseteq \{ c : {}^{*}beats(c, f(c)) \}$

Since the QNP antecedent *a donkey* must be interpreted within the scope of *every man*, the domain of $f(c)$ is defined as the intersective set of the N' restriction of *every*, namely '$Men \cap \{a: \{b: {}^{*}owns(a, b)\} \cap \mathbf{1}\_Donkey\}$'. Likewise, the range of the function is defined as the set of individuals in the intersective set defined by the N' restriction of the determiner for a given value of a, i.e., '$\{b$: $*owns(a, b)\} \cap \underline{1}\_Donkey \neq \emptyset\}$'. The resulting specification of the function associated with the pronoun *it* is formulated in (14). The specification determines the correct range of the function that, provided the maximality condition is met, allows us to specify the U- reading of (12).

(14) f(c) = a function from men who own (an **i**-sum of) at least one donkey into the set of (maximal **i**-sums of) at least one donkey that they own.

Lappin and Francez also claim that **GQE-Ta** enables them to get the correct range of the functions for any relative clause case within donkey sentences. On the other hand, they concede that whereas **GQE-Ta** can apply to the second donkey pronoun (*it*) in conditional donkey sentences such as (15), it cannot to the first one (*he*).

(15) If *a farmer*$_1$ owns *a donkey*$_2$, *he*$_1$ beats *it*$_2$.

This is because, according to Lappin and Francez, the QNP that is the antecedent of the first donkey pronoun (*a farmer*) is not interpreted as within the scope of another quantified NP in the sentence. The general solution, in their words, for this problem goes as follows:

> The antecedent of *he* is not within the scope of another quantified NP, and so the value of the function associated with *he* does not depend upon the selection of an argument in the way that the value of the denoted by the pronoun *it* in [(15)] does. We characterize the function f(x)associated with *he* as assigning the same value to each individual which it takes as an argument. For every x $\in E$, f(x) is the same **i**-sum.(Lappin and Francez 1994, p.417).[6]

Hence, according to Lappin and Francez, the NP denotation of the pronoun is constructed in terms of the maximal—given the maximality condition on the function f(x)—**i**-sum that

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[6] This condition is formulated as follows: for every **i**-sum x such that x$\in E$, f(x) is the same **i**-sum. So, it defines an automorphism on the algebra $\langle E, \vee\rangle$.

is an element of the intersective set '$Farmer \cap \{a: \{b: *owns(a, b)\} \cap 1\_Donkey\}$', namely the set of sets containing the maximal **i**-sum of farmers who own a sum of at least one donkey. Consequently, the domain of the function associated with *he* becomes simply E, the universe of entities. The range will, roughly speaking, be the set of all values (**i**-sums) in the intersective set determined by the N' restriction of the quantified antecedent of the pronoun. As a result, Lappin and Francez add to **GQE-Ta** the following rule:

(**GQE-Tb**) If QNP is not interpreted as within the scope of another quantified NP, then the domain of $f(x)$ is E, and the range of $f(x)$ is the set of **i**-sums in the intersective set defined in terms of the N' restriction of Q (Lappin and Francez 1994 ,p. 418).

Armed with the rule **GQE-Tb**, we now can specify in (16) the donkey function associated with the pronoun *he* in (15). Thus, the complete representation of the sentence will come out as in (17) (' $\rightarrow$ ' is interpreted as the material conditional).

(16) $f(x)$=a function from E into the set of sets containing the maximal **i**-sum of farmers who own at least one donkey.

(17) $(Men \cap \{a: (\{b: *owns(a, b)\} \cap \mathbf{1}\_donkey \neq \varnothing\ )\}) \neq \varnothing \rightarrow$
$((Men \cap \{a: \{b: *owns(a, b)\} \cap \mathbf{1}\_donkey \neq \varnothing\}) \subseteq \{c: *beats(c, {}^{+}f(c))\})$

The interpretation of (17) yields the U-reading of (15), which is specified in (18).

(18) If at least one man owns at least one donkey, then every man who owns at least one donkey beats every donkey he owns.

Moreover, **GQE-Tb** enables us to deal with conditional donkey sentences where the E-reading is prevalent. Examples of sentences of that sort are (19) and (20).

(19) If *a* man_1 has *a* $dime_2$ in his pocket, he_1 puts it_2 into the meter.
(20) If *a* $house_1$ has *a* $barn_2$, it_1 has another two next to it_2.

We now are in a position to explore possible relations between **P5a**, **b** and **GQE-Ta**, **b**.

First, it is important to point out two general differences between them. The first relates to the determiners. As we saw, the criterion for recovering pronominal content implemented in **P5a, b** is that of ***sensitivity to the logical maximality*** of the determiner of the antecedent. In contrast, **GQE-Ta, b** imply that the antecedent QNP of a donkey pronoun always provides, via its N' restriction, the range of the function. Therefore, we may associate the last rules with the characteristic of being always ***sensitive to the restriction*** of the determiners. The second difference concerns the notions of maximality underlying each of the rules. In short, logical maximality does not coincide with cardinal maximality. This can be seen if we focus on the indefinite determiner *a F*. According to Neale, this determiner is logically nonmaximal because it does not imply 'every F is G'. However, it could be cardinally maximal in the context of a U-reading. Furthermore, given that Lappin and Francez conceive U-readings as ***default*** readings, it seems to be the case that indefinites (at least potentially) imply cardinal maximality in donkey contexts. Similar considerations apply to other indefinite determiners, for instance, *n Fs*, *some Fs*, *several Fs*, *at most n Fs*.[7]

The above differences generate different predictions in some cases too. In order to check these predictions let us consider sentences (21) and the already examined (2).[8]

(21) *Every boy*$_1$ danced with *a girl*$_2$. Afterwards, *he*$_1$ gave *her*$_2$ flowers (Neale (1990))[9]

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[7] See Lappin (1989, p. 282, n. 13). As Lappin notices, although universal determiners such as *every F* lack, at surface level, cardinality bounds, they do seem to carry ***presuppositions*** of plurality. Nevertheless, it is worth stressing here that such presuppositions may be cancelled (see telescoping cases in Chapter Three, and note 9 below).

[8] I am deeply grateful to Prof. Shalom Lappin (p.c.) for several clarifications related to the discussion below.

[9] It might be argued that the pronoun *he* in the anaphora sentence of (21) is rather 'marginally salient' in comparison with the plural article *they*. An evaluation of competing theories, based on such examples, seems therefore unreliable. This observation, nevertheless, conflicts with phenomena observed in English regarding the determiner *every*, for instance, telescoping cases and absence of plurality indicators in the definition of *every*. Similar phenomena involving universal determiners can be found in other natural languages as well (for instance, in Spanish as to the determiner *todo*). At any rate, whichever way this issue may be settled, the arguments below will not be affected, since, as Neale argues (Neale 1990, p.234), acceptance of NH for donkey pronouns anaphoric on universal determiners allows us to avoid the problem of number agreement.

(2) *The inventor of bifocals*$_1$ had *a nice house*$_2$. *He*$_1$ used to decorate *it*$_2$ every year.

In either of these cases, the application of **P5** rules or **GQE-T** rules in order to recover the content of the pronoun *he* generates different interpretations of the latter. Let us examine first predictions resulting from application of **P5a,b** to some cases previously considered. For instance, as for sentence (2), we know already that, by using **P5b**, we obtain the representation in (2') below for the pronoun *he*.

(2') *he* = [the x : inventor of bifocals x]

Moreover, since the pronoun *he* in the sentence (21) is anaphoric on the maximal quantifier *every*, a similar representation for that pronoun is obtained. Under the standard interpretation of (21) according to which the determiner *every* takes wide scope, **P5b** recovers the pronominal content of *he* as indicated in representation (21').

(21') ***he*** = [whe x : boy x]

As we already know, Neale's rules recover the content of the pronoun concerned by taking into account only the nominal (of the N' restriction) of the subject NP in the first conjunct of each sentence.

Let us now investigate how Lappin and Francez's rules behave with (21) and (2). At the surface level the subject NPs in the first conjunct of each sentence are not within the scope of the object NPs. Therefore, the domain of the functions associated with the pronoun *he* in each sentence must be constructed in accordance with the rule **GQE-Tb**. Regarding (15) Lappin and Francez specify the denotation of the pronoun *he* as follows:

> [It] is constructed in terms of the **i**-sum, which is an element of the intersective set ... (the set of sums of at least one man who own sums of at least one donkey). (Lappin and Francez 1994, p. 417).

Thus, following Lappin and Francez's explanation, one can construct the pronoun *he* of (2) and (21) in functional terms as indicated in (2") and (21"), respectively.[10]

(2") ***he*** = a function from entities in *E* into the **i**-sum of exactly one inventor of the bifocals who has at least one house.

(21") ***he*** = a function from entities in *E* into the set of **i**-sums in the intersective set of boys who dance with sums of at least one girl.

As a result, different predictions for the anaphora sentences of (2) and (21) are obtained depending on which rules—Neale's or Lappin and Francez's—we choose for recovering the content of the pronoun *he*. In particular, under **GQE-T** rules, one ends up associating the value of the functions specified in (2") and (21") with the descriptions in (2"') and (21"'), respectively.

(2"') The inventor of bifocals who had a nice house.

(21"') The boy (or boys) who danced with a girl.

Undoubtedly, the above descriptions do not coincide with the ones generated by the specifications of the pronouns in (2') and (21'). In (2"') and (21"') the descriptions are constituted by the nominal and the VPs of the antecedent sentences present in (2) and (21). In contrast, the descriptions specified by representations (2') and (21') consist of the nominal only. Thus, if Neale's arguments mentioned in favour of these representations are correct, (2"') and (21"') must be at least inadequate.

There is however a way of rebutting this criticism. The above explanation by Lappin and Francez was intended to apply to cases like sentence (15) where the pronoun is anaphoric on the indefinite determiner *a F* and not on the universal determiner *every F*. Consequently, the representations (2") and (21") and the descriptions generated by them

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[10] In following the Russellian treatment of definite descriptions given in standard GQ theories (for instance in Barwise and Cooper 1981 and Cooper 1983), we also assume that, in a FGQ theory, descriptions like ***the inventor of bifocals*** can be quantificationally treated.

are not related to the E-type pronoun *he* in the anaphora sentence of (2) and (21); thus, no descriptive problem has been posed for **GQE-T** yet. Simple inspection of (15) reveals that this answer can be considered cogent because there the pronoun *he* is effectively anaphoric on an indefinite determiner. Nevertheless, the answer seems to create another problem. Lappin and Francez's rules specify that the range of the function is recovered from the intersective set determined by the N' restriction of the antecedent QNP of the pronoun. Since we do not want to recover the range of the function associated with *he* in (2) and (21) by using (2") and (21"), we have to look for another intersective set distinct from that associated with (2") and (21"). Unfortunately, rules **GQE-T** do not tell us how proceed under such circumstances. Take sentence (21) again. Given that the determiner of the subject NP of the antecedent sentence of (21) is *every*, Lappin and Francez must assign to the sentence representation (22) below.

(22) $Boy \subseteq \{a\text{: } \{b\text{: } {*}danced(a,b)\} \cap \mathbf{1}\_girl \neq \varnothing\}$.

Now, according to **GQE-Tb**, the denotation of the pronoun *he* (its corresponding set of **i**-sums) must be recovered from "the intersective set defined in terms of the N' restriction" of the determiner. But the N' restriction of the determiner in this case is only the nominal and, as shown by (22), this restriction does not determine an intersective set. Consequently, there is no set of **i**-sums defined in terms of that restriction that constitutes the range of $f(x)$; at least, not according to **GQE-T** rules.[11]

Finally, the difficulty above may become more pervasive if we allow for scope interactions. However, whereas it is not entirely clear whether and how we should treat scope ambiguities in Lappin and Francez's theory, criticism on this particular issue

[11] While Prof. Lappin (p.c.) accepts this criticism, he thinks still that **GQE-Tb** could be saved if the intersective set defined in terms of the N' restriction set is obtained by substituting '$\cap$' for the set relation which holds for the N' set and the other set in the antecedent clause. In that case, the substitution would be vacuous in (15), but it would yield the correct intersective set in (22). This move, it seems to us, appears to agree with the normal intuitions, although, as Prof. Lappin recognizes, it implies that, in cases like (22), '$\cap$' would replace '$\subseteq$'. Nevertheless, in our opinion a further appropriate rationale is still needed to justify such an important alteration in the representation of antecedent clauses containing subject NPs with determiners like *every*.

remains a mere conjecture. Let us consider (22) again. It specifies the reading of sentence (21) in which the QNP *a girl* has narrow scope. Now suppose a standard GQ theory that supplies the other possible reading of the antecedent sentence of (21), i.e. the reading where *every boy* takes narrow scope. If that reading is in place, its GQ representation should go as in (23) below.

(23) $(\mathbf{1}\_girl \cap \{b\colon \{a\colon {}^{*}danced(a, b)\} \subseteq Boy\}) \neq \varnothing$

The set *Boy* in (23) is part of the restriction of the QNP *a girl*. Nevertheless, that set does not determine an intersective set. Moreover, it is hardly evident now which other (intersective) set in the structure (23) could determine the range of the function associated with the pronoun *her* in the anaphora sentence of (21). This suggests therefore that **GQE-T** rules are not sensitive enough to scope interactions.[12]

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[12] Prof. Lappin (p.c.) disagrees with the extension of this conclusion. According to him, there is no decisive problem about representing scope assignments in anaphoric sentences through application of **GQE-T**. Consider for instance the sentence (i) below.

(i) Every boy danced with some girl$_2$. She$_2$ was a ballerina (Neale (1990)).

If the QNP *some girl* is going to take narrow scope in the antecedent sentence, the representation of the donkey function associated with the pronoun *she* in the anaphora sentence can be obtained by means of **GQE-Ta.** Thus, we obtain a specification of the function associated with the pronoun *she* such as in (ii) below.

(ii) f_1 = a function from [the intersective set of ?] **i**-sums of boys who danced with girls into **i**-sums of girls (with cardinality of at least one) whom some boy danced with.

Lappin also claims that if *some girl* is going to take wide scope then the donkey function associated with *she* in the anaphora sentence of (i) is obtainable through **GQE-Tb**. The result is shown in (iii).

(iii) f_1 = a function from (the set of) entities into the **i**-sum of girls (with presumably cardinality of 1) who every boy danced with.

Thus, both (ii) and (iii) deliver the correct interpretation for each scope assignment. For, firstly, the value of $f(x)$ in (ii) can be associated with more than one **i**-sum (with cardinality of 1) of girls who danced with ***some*** boy. This interpretation satisfies the narrow scope reading of *some girl*. Secondly, (ii) states that the value assigned to the function can only be one **i**-sum (with cardinality of 1) of girls who danced with ***every*** boy. This interpretation satisfies the wide scope reading of *some girl*. So, in both cases the difference in interpretation crucially depends on the specification of the range. The sole problem with this explanation, it seems to us, lies in the source that licenses the matching between scope assignments and specifications of the range of the functions. As, in our opinion, it is not sufficiently clear how Lappin and Francez deal with scope assignment in non-anaphoric sentences, some additional explanation of that matching is needed. In particular, they should explain how the information of the determiner of the subject NPs in the antecedent sentence of (i) is introduced in the range of the functions in (ii) and (iii). According to Prof. Lappin, a guide

In order to avoid misunderstanding of our argument at this stage, we must emphasise that we are not using the above differences in predictions to prove that **P5** rules should be the preferred to **GQE-T** rules. Our main concern here is to reconstruct **P5**, not to evaluate **GQE-T**. And **P5** rules can be reconstructed quite independently of whether or not **GQE-T** rules are successful in all contexts. What we needed was a clear statement of the advantages of **P5a**, **b**, which would be desirable to preserve in any functional approach to donkey anaphora. We take this goal to have been satisfied in the discussion above. Moreover, our examination of **GQE-T** suggests how implementing rules of pronominal content recovery within functional accounts, and we are going to work out such an implementation in the next section. Finally, the comparison of **GQE-T** with **P5** helped us to also highlight those aspects of the former that, in our opinion, should be preserved in a functional reconstruction of the latter.

6. 2 Functional Recovery Rules With Nonspecificity

The discussion of **GQE-T** rules suggests a way in which a functional version of **P5** can be specified. In order to do that, two important considerations must be taken into account. First, the problems faced by **GQE-T**, indicate that a functional rule works more efficiently if the constraint required to extract the range of the functions from the intersective set is modified. Second, these problems do not seem to affect the key aspect of Lappin and Francez's rules, namely their sensitivity to the restriction of the antecedents of donkey pronouns. Since these rules work well in most standard cases, we think that it would be desirable to retain such a sensitivity to the restriction in any functional version of recovery rules. Obviously, one should attempt to refine that aspect so that the new rules can work equally well in the problematic cases. In order to carry out this

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to answer those questions is found in the extension of **GQE-Tb** suggested in the previous footnote. That extension indicates, according to him, that when, for instance, *some girl* receives narrow scope, the rule will yield the set of boys who danced with at least one girl in the intersective set that yields the denotation of the pronoun *he*.

refinement, we believe that a distinction between proper N' restriction and scope of the determiner should be introduced. The goal of this and other modifications should be the determination of the 'potential' range of the function. In other words, the modifications should allow us to determine the set of **i**-sums (the set of nonspecific or underspecified referents) from the antecedent clause and thereby the range of the function.

We have already argued that there are two main reasons to stick to **P5a, b** rules, namely their simplicity and intuitiveness. It should be clear by now that these features are, for the most part, the common result of other: the sensitivity to the logical maximality that such rules incorporate. It is this key feature of Neale's rules that should, we believe, be preserved in any version of **P5a, b**. Thus, the demands that the logical maximality condition makes on the function representing a donkey pronoun will determine which set in the 'potential' range of the function corresponds to the 'actual' range. In contrast, we think that it is posssible in a functional version of **P5a, b** to dispense with the 'directness' of the content recovery implied by Neale's version. As we saw, directness is based, on the one hand, on the quantificational nature of the antecedent and, on the other hand, on the Neale's claim that E-type pronouns have exactly the same content as their antecedents. This determines the descriptive material to be directly copied from the antecedent. Nonetheless, all problematic cases so far examined—E-readings, complex sage plant cases, and telescoping cases—defeat clearly directness. In all of these cases if E-type pronouns are directly copied from the quantified antecedent, wrong predictions will be generated. The source of this problem, as we have already argued in this dissertation, is that Neale's rules systematically fail to incorporate context when processing the content of donkey pronouns. Thus, surrendering directness obliges us to make our functional recovery rules context-sensitive enough. Such an increase in context-sensitive information is going to come from two sources. First, the information concerning domains—that is, concerning the arguments of the function—will be recovered mainly in accordance with background and contextual knowledge. Here information about different linguistic items, for instance, structure factors, linguistic rules, genders, etc., can also be introduced. In fact, this diversity of the information coming from domains of discourse is a general trait of them when the discourse coincides with the everyday language of the speaker. Therefore, following some recent theories,[13] we take it that no principled definition about what qualifies as domain of a function interpreting natural language expressions can be offered. Second, as regards ranges of donkey pronoun functions, in the normal cases the relevant information is the one directly determined by **P5a, b**. In these cases, we will build up the range by considering whether or not the determiner of the antecedent of the pronoun is logically maximal (in Neale's sense defined in Section 6.1). Nevertheless, it is also possible to determine indirectly the range of the donkey pronouns. This occurs when the domain of the function depends upon the determination of the range of another donkey function. In that case, the range of the first function will be processed once semantic (and pragmatic) information from the second function is supplied. Thus, the recovery of the content of the pronoun need not be directly dependent on its antecedent in the sentence.[14] We will elaborate on the consequences of this last suggestion in the next section.

We now are in a position to propose a set of rules for reconstructing **P5a, b** in a functional setting. These rules will implement and satisfy the requirements formulated above. Yet we need to state a last caveat before beginning our task. In order to keep uniformity with our general viewpoint about the nonspecificity of donkey sentences, we will express our rules with nonspecificity idioms. This means that we will use the terms ***nonspecific compound, nonspecific set*** and ***nonspecific singular denotation*** instead of Lappin and Francez's ***intersective set, set of i-sums*** and ***i-sum*** respectively.

The rule for recovering the domain of the function, or **D-Tdom,** is stated first. What comes next is the rule for recovering the range of the function, or **D-Trg,** which is specified via three subrules. Finally, methodological issues motivating these rules are

[13] See Gauker (1997, p.11). Gauker has also challenged the possibility of defining the pragmatic or contextual determinants of a domain of discourse. He has attacked the standard theory underlying the idea of contextual determinants of discourse, i.e. the expressive theory of communication. For more on domains of discourse and expressivism see Stalnaker (1972), Lewis (1979), Evans (1982) and Bach (1994).

[14] See van der Does (1996) for some formal details on the problem of dependent domains in donkey anaphora.

discussed.

(D-Tdom) *The domain of the function f(c) associated with a donkey pronoun **P** anaphoric on a QNP is restricted by our non-logical, background knowledge about the nonspecific singular denotation, nonspecific collection or nonspecific compound that the antecedent NP of **P** denotes.*

Specifications of **D-Trg** will require distinguishing between a *nominal restriction* (NR) and a *scopal restriction* (SR) of the determiner (D). Syntactically speaking, NR corresponds basically to the head of the NP coindexed with the pronoun (see **FuC**(c) in Chapter Five) and SR corresponds to the sentence (the sister) to which the NP is adjoined. In terms of restricted quantifier schemas like, for instance, '[*D*x: *F*x] (*G*x),' we can say that NR stands for (the set determined by the predicate) '*F*x' and SR for (the set determined by the predicate) '*G*x'. The specifications of **D-Trg** can now be formulated.

(D-Trg a) *If f(x) is a single function associated with a donkey pronoun **P** whose antecedent is a NP with a logically maximal determiner D, then the range of f(x) determined by D is equal to the cardinally maximal nonspecific set associated with NR..*

(D-Trg b) *If f(x) is a single function associated with a donkey pronoun **P** whose antecedent is a NP with a logically nonmaximal determiner D then the range of f(x) determined by D is equal to the nonspecific compound constituted by the sets associated with both NR and SR .*

(D-Trg c) *If the denotation of a donkey pronoun **P** depends on the denotation of another donkey pronoun **P'** then the domain of the function f(x) associated with **P** depends on the determination of the range of another function **g**(y) associated with **P'**.*

We now clarify some methodological issues behind the rules. First, some considerations about **D-Trg.** It should be clear that **D-Trg a-c** incorporate the constraints discussed above. **D-Trg a** and **b** express the direct recovery process of the range from the donkey function whereas **D-Trg c** formulates the indirect process. Besides, considerations of cardinal maximality are not necessary in **D-Trg b** since, as we learnt from the cardinal maximality condition, presence of logically nonmaximal determiners in the antecedent may or may not cancel the maximality condition. Finally, it is worth stressing that standard sets (sets with atomic individuals as their members) can also be part of the nonspecific compound determining the range of the function. However, at least ***one*** nonspecific set is obviously needed in order to determine such a compound.

Second, we clarify some aspects of **D-Tdom**. This rule allows us to introduce systematically background and common knowledge. This knowledge can be understood as the set of presuppositions and beliefs presumably shared by all speakers and hearers when processing a given donkey sentence or utterances of other sentences preceding the donkey sentence. The notion of background knowledge or 'common ground' used here has now become standard in semantics. It derives from work by Stalnaker (1974, 1978, 1984) and current work on the semantics of across-discourse anaphora by Roberts (1987, 1989, 1995, 1997) Heim (1983, 1990), Chierchia (1995) and Kratzer (1981, 1989), and others. Furthermore, **D-Tdom** requires a certain minimal consistency with semantic or syntactic information, i.e. with characteristics of the pronouns such as gender, number syntactic, mood and modalities, tense, and so on. In this section the theoretical grounds sustaining this sort of consistency will rely intuitively on processes of *accommodation* of the contextual material in the domain, as defined in the aforementioned literature.[15] In the following section, however, we shall give a clearer idea about how to incorporate this notion in a wider functional framework. Lastly, we have introduced the apparently arbitrary clause 'non-logical' in **D-Tdom,** in order to exclude irrelevant information concerning the 'bare' entities in a model or situation. For instance, information about of their being individuals, worlds, properties, times, events, etc. and other related notions.

[15] Accommodation was introduced as a proper topic in semantics and pragmatics by Heim (1982) and it has later been refined by various authors, for example, Roberts (1987, 1989), Heim (1990), Kadmon (1990) and Chierchia (1992, 1995). The first non-technical formulation of accommodation was due to Lewis (1979). Lewis tried to make sense of the idea of a presupposition based on contextual or conversational grounds. According to him, if a speaker presupposes something that is not explicit in the conversation or discourse, the hearer will behave as if such a presupposition were already in the common ground. Lewis' notion seems closely related to Stalnaker's idea of background knowledge; see Stalnaker (1978).

We consider that such information is non-contextual and thereby does not contribute to constrain the domain of the function from the speaker viewpoint.

In what follows some initial applications of **D-T** rules will be introduced. First, we will show how recovering indirectly the domain and the range of the donkey functions in most typical cases. In these cases, representations of the complete donkey sentence will not be provided; only those of the donkey pronoun. Sentence (24) below is obviously the first case to examine (all specifications of range and domain are supplied in an intuitive way for the sake of simplicity).

(24) Every man who owns a donkey$_1$ beats it$_1$.

it = ^+f= domain : male human beings who own a donkey.
range : the maximal nonspecific compound of donkeys (with cardinality of at least one) that are owned by anyone of those men.(x **D-Trg b**)

The explanation of the function ^+f associated with the donkey pronoun *it* in (24) is straightforward. The domain of the function is obtained by tracking background information from the antecedent NP of the pronoun *it*, i.e. *man who owns a donkey*. We do so by assuming pragmatic-based information from the NP in question, in accordance with **D-Tdom**. On the other hand, since the donkey pronoun is anaphoric on the logically nonmaximal determiner *a*, the range of the function is obtained by application of **D-Trg b**. The (standard) set associated with NR is the set of donkeys. The nonspecific set associated with SR is the set of nonspecific singular denotations that are owned by someone. We obtain thus a nonspecific compound generated by NR and SR. According to **D-Trg b**, the range of the function associated with *it* is equal to this nonspecific compound. Because the function in question is subject to the maximality condition and there is no cardinality restriction cancelling this condition, the range must denote a cardinally maximal nonspecific compound of donkeys owned by men who own a donkey. This specification of the range provides, therefore, the correct result, namely the U-reading of the donkey sentence (24).

The sort of logical maximality affecting the determiner of the ***antecedent*** NP of the donkey pronoun will henceforth be indicated by a superscript. Thus, '$^{+M}$ indicates that the determiner on which the pronoun is anaphoric is logically maximal, whereas '$^{\neg M}$ indicates that the determiner in question is logically nonmaximal. Finally, since the donkey function can now take nonspecific denotations, sets, etc. in its range, its representation will be modified: when necessary, the superscript $^{\text{ns}}$' will be attached to the right-hand side of the function. The same practice will apply to nonspecific sets. In what follows, specifications of the donkey functions corresponding to a sage plant sentence and to a sentence where the E-reading is the preferred one are formulated.

(25) Everyone who bought a sage plant$_1$ here bought five others along with it$_1$.

it = $^{\neg M \neg}f^{ns}$ = domain : male or female human beings who bought sage plants
range : the nonmaximal nonspecific compound of sage plants (with cardinality of at least 1) that were bought by those human beings. (x **D-Trg b**)

(26) Every person who had a dime$_1$ in his pocket put it$_1$ into the meter.

it = $^{\neg M \neg}f^{ns}$ = domain : male human beings who have dimes in their pockets
range : the nonmaximal nonspecific compound of dimes (with cardinality of at least 1) that are kept in the pockets of those men .(x **D-Trg b**)

The superscripts attached to the functions in (25) and (26) indicate that we have applied **D-Trg b** to both representations of the pronoun because of the determiners of each donkey pronoun being logical nonmaximal. The correctness of the results can be easily verified.

Before analysing more complex cases let us consider a simple example handled adequately by Neale: unmodified donkey conditionals like sentence (15) in Section 6.1. Since is crucial, in our opinion, to consider scope assignments in this and other cases, we will henceforth use the restricted set notation introduced in Chapter Two, Section 2.2, which, given our above discussion, seems more suited than GQ notation to deal with scope issues. The novelty in the restricted set representations below, is that they incorporate functional expressions to represent donkey pronouns in the same fashion as FGQ representations do. We here repeat the sentence (15) as (27).

(27) If a *farmer*$_1$ owns *a donkey*$_2$ *he*$_1$ beats *it*$_2$.

As interaction of the quantifiers in (27) induces scope ambiguity in the antecedent sentence, we obtain the following two representations

(27') $[[\ [\exists F{:}|F|\geq 1][(\exists x)x\in F]]\ (\ [[\exists D^{ns}{:}|D^{ns}|\geq 1]\ [(\exists y)\in D^{ns}]]\ (\ {*}Ox\ y)\ )$

(27'') $[[\ [\ \exists D^{ns}{:}|D^{ns}|\geq 1]\ [(\exists y)\in D^{ns}]]\ (\ [[\exists F{:}|F|\geq 1][(\exists x)x\in F]]\ ({*}Ox\ y)\ )$

Structure (27') corresponds to the narrow scope reading of *a donkey*. This explains why its formal representation '$[[\exists D^{ns}{:}|D^{ns}|\geq 1][(\exists y)\in D^{ns}]]$' appears inside the round parentheses ('D^{ns}' stands for a nonspecific set of donkeys). Structure (27''), in its turn, corresponds to the narrow scope reading of *a farmer*. This is why the formal representation of the latter '$[[\exists F{:}|F|\geq 1][(\exists x)x\in F]]$' appears inside the round parentheses ('F' stands for a classical set of atomic individuals, namely farmers). Finally, we generate the following functional representation of the consequent sentence (*he* beats *it*).

(27''') $(\forall c)(\ {*}B\ (\ {}^{\neg M+}f^{ns}(c),\ {}^{\neg M+}g^{ns}(\ {}^{\neg M+}f^{ns}(c)\ )\ )$

Examination of (27''') suffices for disclosing that, by using **D-Trg c**, we have simplified the GQ representation of (15) given in Section 6.1. The range of the function associated with *it* cannot now be directly recovered because its domain is actually the range of the function associated with the pronoun *he*, that is, the nonspecific compound (or intersective set) defined by the NP *men who own a donkey*. The simplification that at this point we want to suggest is to treat a donkey pronoun dependent on another one as a ***composite function***. Thus, the range of the first function becomes the domain of the second, and thereby the range of the latter becomes constrained by information coming from the former.[16,17]

Since using restricted set notation allows us to capture scope ambiguities in the functional setting, the differences between the recovered content from the donkey functions of the pairs (27')-(27''') and (27'')-(27''') will depend on the chosen scope assignment. This is shown in both (27'a, b), which corresponds to the interpretation of the pronouns under the narrow scope *reading of a donkey*, and in (27''a, b), which corresponds to the interpretation of the pronouns under the narrow scope reading of *a farmer*.

(27' a) **he** = $^{\neg M+}f^{ns}$ = domain : male farmers who own at least one donkey.
range : the maximal nonspecific compound of farmers (with cardinality of at least 1) who own nonspecific individuals of the set of donkeys (with cardinality at least 1).
(x **D-Trg b**)

(27' b) **it** = $^{\neg M+}g^{ns}$ = domain : the range of (27' a)
range: the maximal nonspecific compound of donkeys (with cardinality of at least 1) owned by at least one of the farmers in the domain (x **D-Trg b**)

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[16] See van der Does (1996) for a different solution to this problem. For a general definition of both dependent domains and dependency between range and domain of donkey functions, see Appendix I.

[17] It is worth stressing here that, from a formal point of view, the notational simplification in question stems, in fact, from FGQ. In order to see that, we must recall two facts related to Lappin and Francez's treatment of sentence (15) above. First, the two pronouns in the relational sentence '**he** beats **it**' are donkey functions of the form '$f(x)$' and '$g(y)$', respectively. Consequently, an elementary representation of the sentence concerned is '$*Rf(x),g(y)$'. Second, the set-theoretical expression generated for the whole sentence (15) can also be represented by the schema '$\{K\} \neq \emptyset \rightarrow \{K\} \subseteq \{c: *R(c, g(c))\}$'. Thus, the representation of the relational sentence '**he** beats **it**' is defined to be '$\{K\} \subseteq \{c: R(c, g(c))\}$', which, in its turn, can be abbreviated as '$K \subseteq G$'. '$K \subseteq G$' is then truth-conditionally equivalent to '$*Rf(x),g(y)$'. Since the argument of the function '$g(y)$' is the first element of the ordered pair of R in '$\{c: *R(c, g(c))\}$', it follows that 'y' in '$*Rf(x),g(y)$' is equal to '$f(x)$' and, therefore, that 'g' is equal to the composite function '$g(f(x))$'. Thus, with appropriately specified functions and obvious simplifications, the following equivalence holds: '$(\{K\} \neq \emptyset \rightarrow K \subseteq G) \equiv (\{K\} \neq \emptyset \rightarrow (*Rf(x),g(f(y))))$'. Given that GQ theories force severe constraints upon the representation of subject NPs, the proposal of dealing with these cases as composite functions can be seen as a convenient but optional simplification for FGQ approaches. In other frameworks it, however, may be assumed directly.

(27" a) **he** = $^{\neg M+}f^{ns}$ = domain: male farmers who own things.
range : the maximal nonspecific compound of farmers (with

cardinality of at least of 1) who own at least one value of a nonspecific set (with cardinality of at least 1)
(x **D-Trg b**)

(27" b) **it** = $^{\neg M+}g^{ns}$ = domain : the range of (27" b) .
range: the maximal nonspecific compound of donkeys (with cardinality at least 1) owned by at least one of the farmers in the domain. (x **D-Trg b**)

Specifications of the ranges of (27' b) and (27" b) seem distinct because the respective domains of the functions are at first sight different—they correspond to the ranges of (27'a) and (27" a). This impression is, however, mistaken. A closer examination of the interaction range-domain in each case reveals that the interpretations coincide. Both ranges state that the members of the nonspecific set of donkeys (with cardinality of at least 1) are owned by the members of the nonspecific set of farmers (with cardinality of at least 1) who own at least one member of the first nonspecific set. This matches the predictions made by Neale's theory at this point. Neale's theory generates logically equivalent representations for the consequent of (27) (*he* beats *it*) as (28) and (29) show.[18]

(28) [whe x: man x & [a y : donkey] (x owns y)]
([whe y: donkey y & x owns y] (x beats y)).

(29) [whe y: donkey y & [an x: man x] (x owns y)]
([whe x : man x & x owns y] (x beats y)).

In what follows, it is explained how our proposal deals with two problematic cases reviewed earlier. They are the sentences (30) and (31) below.

(30) *The inventor*$_1$ of bifocals has *a nice house*$_2$. *He*$_1$ used to decorate *it*$_2$ each year.

[18] See Neale (1990, p.247).

(31) Every boy danced with *a girl*$_1$. *She*$_1$ was a ballerina.

The following are the two representations that our approach generates for the first sentence of (30) when it receives the normal scope assignments.

(30') $[\,[\exists B: |B|=1]\,[(\forall x)x\in B\,]\,]\,([\,[\,\exists H^{ns}: |H^{ns}|\geq 1\,][(\exists y)y\in H^{ns}]\,]\,(\,{}^*Dxy\,))$

(30") $[\,[\exists H^{ns}:|H^{ns}|\geq 1][(\exists y)y\in H^{ns}]]\;([[\exists B:|B|=1]\,[(\forall x)x\in B\,]\,]\,({}^*Dxy\,)\,)$

In structure (30''') we specify the second sentence of (30) by using composite functions. In (30'a)-(30'b) and (30"a)-(30"b) we specify the range and domain of the pronouns involved.

(30''') $(\forall c)\ {}^*C({}^{+M+}f(c),\ {}^{-M+}g(\,{}^{+M+}f(c)\,)$

(30'a) **he** = ^{+M+}f = domain : male human beings who invented bifocals and have nice houses
range : the maximal set of inventors of bifocals (with cardinality of exactly 1, i.e. the unique specific value of the set.) (x **D-Trg a**)

(30' b) **it** = $^{-M+}g^{ns}$ = domain : the range of (30' a) (x **D-Trg c**).
range : the maximal nonspecific compound of houses (with cardinality of at least 1) owned by one member of the specific set of inventors of bifocals in the domain. (x **D-Trg b**)

(30" a) **he** = $^{+M+}f^{ns}$ = domain : male human beings who invented bifocals and own something
range : as in (30' a). (x **D-Trg a**)

(30" b) **it** = $^{-M+}g^{ns}$ = domain : the range of (30"a)(x **D-Trg c**).
range : the maximal nonspecific compound of houses (with cardinality at least 1) owned by the unique value in the domain who own something. (x **D-Trg b**)

As in (27) above, the difference between the ranges of (30' b) and (30"b) is only a superficial one. This is because (30') and (30") retain the uniqueness presupposition of the definite description *the inventor of bifocals* in (30). Nonetheless, the non-preferred reading without this presupposition can still be captured if we stipulate the non-uniqueness condition for the narrow scope interpretation of the description. Thus if the cardinal condition '$|H^{ns}| \geq 1$' is substituted for '$|H^{ns}| = 1$' in (30"), something like a narrow scope interpretation of a universal determiner is obtained.

Let us now consider the compound sentence (31). In (31') and (31") we formulate the two scopal representations of its first sentence together with the functional representation of the anaphora sentence. Finally, (31'a) and (31"a) specify the range and domain of the function.

(31') $\exists^{\neg/+}f\{[\,[\exists B{:}|B|\geq n][(\forall x)x\in B\,]]\,([\,[\exists G^{ns}{:}|G^{ns}|\geq 1][(\exists y)y\in G^{ns}]]\,({*}Dxy\,))\ \&$
$\&\ (\forall c)({*}B\ {}^{\neg M+}f^{ns}(c))\,\}$

(31") $\exists^{\neg/+}f\{\,[[\exists G^{ns}{:}|G^{ns}|\geq 1][(\exists y)y\in G^{ns}\,]\,]\,([\,[\exists B{:}|B|\geq n][(\forall x)x\in B\,]]\,(\,{*}Dxy\,))\ \&$
$\&\ (\forall c)({*}B\ {}^{\neg M+}f^{ns}(c))\,\}$

(31' a) **she** = ${}^{\neg M+}f^{ns}$ = domain : boys who danced with some girl or girls.
range : the maximal nonspecific compound of girls (with a cardinality of at least 1) whom somebody in the domain danced with. **(xD-Trg b)**

(31" a) **she** = ${}^{\neg M+}f^{ns}$ = domain : boys who danced with somebody
range : one of the values in the maximal nonspecific compound of girls (with a cardinality of at least 1) who every boy in the domain danced with. (x **D-Trg b**).

Representation (31') (where *a girl* takes the narrow scope reading) and the specification of the function associated with the pronoun in (31'a) suggest a promising route to sort the problem posed by sentence (31) out (see Chapter Three, Section 3.4). Those who danced with nonspecific singular values, with a cardinality of at least 1, belonging to the set of girls, are boys who danced with some girl or girls. The set of boys determines therefore which girls are ballerinas. Thus, this information is, in part at least, recovered indirectly from the relevant aspects constraining the domain and imposing particular conditions on the values in the range.

Our rules will be applied finally to the so-called donkey conditionals with adverbs of quantification discussed mainly by Lewis (Lewis (1975)), Heim (Heim (1990)) and Kadmon (Kadmon (1990)). They are illustrated in (32), (33) and (34) below.

(32) *Usually* if a man_1 owns a $donkey_2$, he_1 beats it_2.
(33) *Generally* if a $person_1$ has a credit $card_2$, he_1 pays his bill with it_2.
(34) If a boy_1 receives a little $donkey_2$ he_1 is *always* so proud of it_2 .

Here we shall only consider sentences (32) and (33). These sentences generate at least three different types of interpretation usually termed by semanticists the symmetric, subject asymmetric and object asymmetric reading. In order to capture the relevant differences between them, let us suppose, by following Lewis (1975), that the adverb ***usually*** stands for a (binary or unary) quantificational operator ^{A}Q which binds all free variables inside the *if*-clause or *if*-ϕ clause. Thus, adverbial quantifier sentences will be of the form '[^{A}Q *if*-ϕ](ψ),' with 'ψ' as a matrix clause on which the adverbial operator has scope. The important question concerning (32) and (33) is how ^{A}Q quantifies over the variables in the restriction of the determiners (including the relative restrictive clauses) of such sentences. Consider (32) for the sake of simplicity. Since the restriction in (32) crucially involves sets of men and donkeys, three different interpretations are possible. The first is that in which the adverbial operator quantifies over each man who owns a particular donkey, that is, over donkey-donkey owner pairs. This interpretation corresponds to the symmetric reading of (32); i.e. that in which most of those pairs satisfy the predicate *x beats y*. The second interpretation is that in which the adverbial operator involves the quantification over a one-to-many relationship between donkey owners and donkeys. This is the subject asymmetric reading of (32); i.e. that in which most donkey owners beat their donkeys. The third interpretation is that in which the adverbial operator quantifies over a many-to-one relationship between donkeys and the man who owns them. This is the object asymmetric reading of (32); i.e. that in which most such donkeys are beaten by the same man who owns them.[19] In the symmetric reading, the operator *usually* presupposes a uniqueness relationship between a particular man and the donkey that he owns. As far as the subject asymmetric reading is concerned, the adverbial operator is interpreted as quantifying over each man who owns at least one donkey. In this case, the adverbial operator cannot presuppose uniqueness because the relation donkey-donkey owner does not imply any upper cardinality boundary. A similar conclusion applies to the object asymmetric reading. Finally, although only subject asymmetric readings will be investigated here from the nonspecificity point of view, our analysis will suffice to show that the remaining readings can also be considered a part of the same nonspecificity phenomenon.

Our proposal again relies extensively on Lappin and Francez's approach. As their solution to the problem of donkey quantificational adverbs strikes us as essentially correct, here we suggest just a sort of alternative refinement of it. Lappin and Francez's solution interprets adverbial operators as generalized quantifiers on sets of situations. Donkey pronouns are then relativized to this kind of set in the following way: each donkey pronoun has a denotation specified in terms of the function $f(s, x)$ from pairs of situations and individuals to **i**-sums (in our case, to nonspecific singular denotations). How they obtain the correct denotation of the donkey pronouns of a sentence like (32), is explained as follows: "[F]or each pair <s, x> where s is a situation in which a man owns an **i**-sum of at least one donkey and $x \in E$, $f(s, x)$ = the **i**-sum that yields the NP denotation" (Lappin and Francez 1994, p. 423). In other words, the range of the function will denote the value of the NP *man who owns in the situation s an **i**-sum of donkeys (with cardinality of at least* 1*) in the intersective set of donkeys and things owned in s.* Their definition of "usually if ϕ, then ψ" as an ^{A}Q operator depends on reinterpreting *usually* as the binary quantifier *most*. This runs as follows:

[19] It has been pointed out in the literature (Heim 1990, Kadmon 1990), that the first and third readings are unnatural in conditional donkey sentences like (32) and (33). Moreover, symmetric readings pose persistent difficulties for accounts of donkey anaphora based exclusively on quantification over situations or events. Most serious of all is the so-called *proportion* problem, which affects directly Heim's (1982) account; see Kadmon (1990), Berman (1986), and Larson and Segal (1995).

(35) $\| \text{ usually if } \phi \text{, then } \psi \|^{g} = \text{true iff } | \{s: \|\phi\|^{g,s} = \text{true}\} \cap \{s': \|\psi\|^{g,s'} = \text{true}\} | > 50\%$
$| \{s: \|\phi\|^{g,s} = \text{true}\} |$.

(The function 'g' (in superscript) corresponds to an assignment function of values to free variables in formulae and 'g,s' corresponds to that assignment in a particular situation s).

As a result, Lappin and Francez derive (36) below as the general representation of (32).

(36) $| \{s: \{x: \text{Man}(s, x)\} \cap \{a: \{b: {*}\text{owns}(s, a, b)\} \cap \{y: \text{1\_donkey}(s, y)\}$
$\neq \emptyset\} \neq \emptyset\} \cap \{s': (\{x: \text{Man}(s', x)\} \cap \{a: \{b: {*}\text{owns}(s',a,b)\} \cap \{y: \text{1\_donkey}(s',y)\}$
$\neq \emptyset\}) \subseteq \{c: {*}\text{beats}(s',c,f(s', c))\}\} | > 50\% | \{s: \{x: \text{Man}(s, x)\} \cap$
$\{a: \{b: {*}\text{owns}(s,a,b)\} \cap \{y: \text{1\_donkey}(s,y)\} \neq \emptyset\} \neq \emptyset\} |$

The 'generality' feature of (36) can be grasped in observing that the function f in this representation has not been entirely specified yet. The maximality condition, although operative in f (there is no cardinality restriction constraining the VP of (32)) does not suffice to determine the subject asymmetric reading (or the other readings, for that matter). This is because there are three possible ways of characterizing the set of situations in (37) below, according to the three possible readings of sentence (32).

(37) $\{s: \{x: \text{Man}(s, x)\} \cap \{a: \{b: {*}\text{owns}(s, a, b)\} \cap \{y: \text{1\_donkey}(s, y)\} \neq \emptyset\} \neq \emptyset\}$

As might be expected, Lappin and Francez's answer to this problem is that symmetric or asymmetric readings can be obtained "by varying the parameter for identifying the situations in the set of situations" of (37) (Lappin and Francez 1994, p. 424). In our terms, this answer suggests interpreting adverbial donkey quantification as an expression of further specifications over an original nonspecific pattern, similar in nature to **nss1** or **nss2** of Chapter Five. Therefore, if, as we are going to show, it is possible to make out a good case for this interpretation, we should conclude that all the aforementioned readings are in principle available in the original pattern.

One alternative for varying systematically the parameter of situations in (37) is to conceive of it as 'sensitive to the minimality' of the situations involved.[20] So, if the parameter concerned is symbolized as '+/¬min' and added to '**s:**' in (37), then we obtain an immediate representation of the nonspecific pattern for the set of situations and, whereby, for the adverbial donkey quantification, which is expressed by **nss4** below.

(**nns4**) $\{s^{+/\neg min}: \{ x: F(s, x) \} \cap \{ a: \{b: {*}G(s, a, b) \} \cap \{y: n\_H(s, y) \} \neq \varnothing\} \neq \varnothing\}$

Now, if, due to contextual information, the set of situations in **nss4** is specified as '$s^{\neg min}$'—as a set of maximal situations— then no constraint of uniqueness can be imposed upon the ordered pair <a, b> in the above schema. Sentence (36) represents a set that contains all and only the situations s in which, given an ordered pair <a, b>, b represents just the maximal **i**-sum (or nonspecific singular denotation) of donkeys that a owns. Furthermore, since maximality of the donkey pronouns is operative in the consequent of sentence (32), *f*(s, c) in (36) will denote the maximal **i**-sum of donkeys that c owns in s. So, in Lappin and Francez's words "it follows that [(32)] is true on this interpretation iff most situations s in which a man owns an **i**-sum of at least one donkey in s are such that the man beats in s every donkey he owns." (Lappin and Francez 1994, p.425). Coming back to our approach, this means that the subject asymmetric universal reading of (32) amounts to the specification '$s^{\neg min}$' (determined by contextual information) of the schema **nss4**. Something similar is bound to occur with the symmetric reading, if we specify the set of situations in **nns4** as 's^{+min}'.[21] [22]

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[20] Heim (1990) and Kadmon (1990) have argued for this constraint. Heim defines a minimal situation as follows: $\min S = \{ s \in S : \neg\exists s' \in S[s' \leq s \ \&\ s' \neq s] \}$.

[21] In this point our approach seems to face a difficulty. Since the nonspecific '$s^{+/\neg min}$' parameter allows us to generate two possible specifications ('$s^{\neg min}$' or 's^{+min}'), we are left apparently with just two readings, the symmetric and the subject asymmetric one, and thereby the object asymmetric reading remains beyond our reach. Nevertheless, in fact the generation of the latter depends on additional specifications in the sets and the relational predicate of **nns4**. We can thus stipulate that *F* stands also for a set of **i**-sums (or nonspecific values) of cardinality of at least one and that **G* applies in s to pairs <a, b> such that a is an **i**-sum of at least one *F* and b is an **i**-sum of at least one *H*. Therefore, *f*(s, c) will correspond to an **i**-sum of *H* to which a is **G*-related (in s). Since the other relational predicate associated with the function *f* ('*beat' in (36)) has also to connect pairs of **i**-sums as **G* does, and maximality is operative on *f*, we obtain a reading of (32) according to which (32) is true iff most situations s in which an **i**-sum of at least one donkey owned by an **i**-sum of at

Finally, let us show how we are going to represent the subject asymmetric reading of (32). If our suggestions about the representation of the consequent of (15) are applied to the consequent in (32) above and we operate with the definition of the adverbial operator in (35), we obtain the simplification shown in (38).

(38) $| \{s: \{x: \text{Man}(s, x)\} \cap \{a: \{b: {*}\text{owns}(s, a, b)\} \cap \{y: \text{1\_donkey}(s, y)\} \neq \varnothing\} \neq \varnothing\} \cap \{s': \{c: {*}\text{beats}(s', {}^{+}f^{ns}(s', c), {}^{+}g^{ns}({}^{+}f^{ns}(s', c)))\}| > 50\%$
$| \{s: \{x: \text{Man}(s, x)\} \cap \{a: \{b: {*}\text{owns}(s, a, b)\} \cap \{y: \text{1\_donkey}(s, y)\} \neq \varnothing\} \neq \varnothing\} |$

It is easily checked that in (38) the entire representation of the consequent sentence '*he* beats *it*' is reduced to the set '$\{s': \{c: {*}\text{beats}(s', {}^{+}f^{ns}(s', c), {}^{+}g^{ns}(f^{ns}(s', c)))\}$,' which is equivalent to the generalized quantifier representation of this sentence in (36) above.

Although the GQ representation (38) seems theoretically attractive for approaches strictly based on GQ theory, we would like to offer here an alternative in terms of restricted set notation. The sole purpose of this alternative is to show that, in principle, we do not need to modify **D-Trg** and **D-Tdom** substantively in order to accommodate cases containing situations. Consequently, what comes next may be improved or modified in different

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least one man in s are such that the donkeys owned by at least one man are beaten by him. This interpretation corresponds to the object asymmetric reading.

[22] See Lappin and Francez (op.cit., p. 425) for more detail. Here another question confronts our analysis. Given that we argued in Chapter Three directly against an analysis of standard donkey sentences in terms of minimal situations and uniqueness, the present incorporation of this analysis for dealing with adverbial donkey quantification seems to clash with our previous arguments. This impression is, however, illusory and due to three reasons. First, in Chapter Three we criticised the claim that situations, or minimal situations, are ***structural*** semantic aspects of the representation of standard donkey sentences, as Heim and Kadmon contend. Nevertheless, our arguments were not directed against the idea that minimal situations and uniqueness may be constitutive of the ***pragmatics*** of such sentences. Second, we believe that considerations similar to the ones brought forward by Lappin and Francez in support of the claim that the maximality condition generates a default interpretation, apply to the condition of non-minimality or maximality associated with the set of situations. Thus, maximality in the context of adverbially quantified donkey sentences can be seen as the result of cancelling non-minimality via processing pragmatic knowledge related to the VPs, the nonspecific sets, or other parameters. Third, consequently we suggest to view minimal situations as instruments to explain the reading that presupposes uniqueness (i.e. the symmetric reading) and thereby as underdetermined by pragmatic constraints.

ways.

Our suggestion is based on a proposal by McCawley (1993) to deal with the determiner *most.* First we introduce the definition of McCawley's for that quantifier (we modify it a little to suit restricted set notation).

$$(39)\ [\ \exists M\!: (M \text{ more than half of } \{x\!: x \text{ is } F\})][[\ (\forall x)(x \in M)](Gx)]$$

Definition (39) can further be simplified to sentence (40) below, where '{F}' is an abbreviation for '{x: x is F}'.

$$(40)\ [\ \exists M\!: |M|>50\%\{F\}][[\ (\forall x)(x \in M)](Gx)]$$

Thus, structure (38) can be formulated in terms of the restricted notation structure (41), where the restricted set expression '$[[\exists S'^{\,ns}\!: |S'|>50\%\{S\}]\ [(\exists s')(s' \in S')]$' can be translated as 'there is a set of (non specific) situations S' such that it is the set of more than 50% of the situations of the set S and such that s' belongs to S'.'

$$(41)\ [[[\exists M\!:|M|\geq 1]\ [(\exists x)x \in M]]\ (\ [[\exists D^{ns}\!:|D^{ns}|\geq 1][(\exists y)\in D^{ns}]]([(\exists s)(s \in S)](\ {}^{*}Oxy,s))\ )]$$
$$([[\exists S'^{\,ns}\!:|S'|>50\%\{S\}]\ [(\exists s')(s' \in S'\ )]]\ ((\forall c)(\ {}^{*}B(\ s', {}^{+}f^{ns}(s', c), {}^{+}g^{ns}(\ {}^{+}f^{ns}(s', c))))))$$

The first clause of (41) describes the narrow scope reading of *a donkey* in the antecedent of (32), and the second one describes the consequent of (32). According to the second clause, most (more than 50% of) situations s in which a man owns a member of the nonspecific set of donkeys with cardinality of at least one in s are such that the donkey-owner beats in those situations every donkey he owns. Thus, if representation (41) is correct, then the domain and the range of the functions involved can be constructed on the basis of the specifications given for the standard function associated with sentence (15)—the non-adverbial version of (32)—plus situations. [23]

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[23] For other applications of **D-T** rules to donkey and non-donkey cases see Appendix II.

6. 3 Recovery Rules, Representations and Anaphoric Discourse

In this last major section we turn to deal with a problem which affects all donkey anaphora approaches, namely: that of representing donkey anaphora across discourse. As we suggested above, this problem is closely related to the general problem of how context influences the interpretation of donkey sentences. The former poses thus a challenge to all approaches not only in terms of the representations they generate for donkey anaphora across discourse but also in terms of the recovery procedures to which they appeal to determine the content of donkey pronouns. A systematic answer to the problem of donkey anaphora across discourse obviously would take us beyond the limits of this essay. The discussion and the ensuing suggestions below must, therefore, be considered only as an initial and sketchy approximation to these important issues.

As we have seen in the previous sections, contextual information becomes crucial in the construction of semantical representations for some fragments of natural language containing donkey anaphora. The donkey functions introduced in this chapter, couched in either GQ or restricted set notation, capture an important amount of contextual information because they incorporate explicitly parametric information. Accordingly, context-sensitivity obtains just as a consequence of the functions embedded in donkey sentences. Thus, it is, first, the application of different constraints (cardinal maximality, minimality of situations and others) to donkey functions that allows us to introduce contextual and real world knowledge into the representations of donkey sentences. Second, it should be clear that **GQ-ET** rules do not directly introduce pragmatic or contextual information into representations. In fact, part of our criticism of **GQ-ETb** was related to that aspect. Unfortunately, although **D-T** rules (in particular **D-Tdom**) incorporate explicitly contextual information in processing donkey functions, their results in some cases disagree with the representations that speakers associate with the utterance of sentences containing E-type and unbound pronouns. This can be appreciated by examining the following examples.

(42) No *Hondurans*$_1$ voted. *They*$_1$ were intimidated by the secret police. (Neale 1990)[24]

(43) Not *every paper*$_1$ that gets submitted to a journal is a good paper. If *it*$_1$ is accepted, *it*$_1$ is a good paper. (Poesio and Zucchi 1992)

We shall first discuss the problem that these cases pose Neale's rules and afterwards apply the result of this discussion to **D-T** rules.

Examples (42) and (43) involve monotone decreasing quantifiers and hence the determiners of the antecedent sentence cannot be maximal. Consequently, therein the pronouns must be recovered through application of Neale's **P5a** rule (which resembles to our **D-Trgb** rule). According to that rule, the descriptive content of the pronouns in (42) and (43) should be recovered as in (42') and (43') below.

(42') *The Hondurans who voted* were intimidated by the secret police.

(43') If *the paper submitted to a journal which is a good paper* is accepted, it is a good paper.

In both cases, however, the recovered content conflicts with semantic intuitions of the speaker. As Neale has acknowledged (1990, p. 221), one would expect to recover in the first case only the nominal restriction (NR) and not the scopal restriction (SR) of the QNP. The same applies to (43'), where the content to be recovered should arguably be *the paper submitted to a journal*. Also, from a pragmatic standpoint our intuitions about verbal communication clearly dictate the inacceptability of (42') and (43'). For instance, from a Gricean point of view, we would characterize the contextual inacceptability of (42') and (43') as a consequence of violating some conversational Maxims.[25] Sentence (42') clearly infringes the Maxim of Quality, because of its incompatibility with the information supplied by the antecedent sentence of (42) that states that no Hondurans

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[24] Prof. Lappin disagrees about considering (42) as a standard case of E-type anaphora. Neale seems to imply that it is a case of D-type anaphora (see Neale 1990, p. 221).

[25] See Chapter Two, Section 2.1.

voted. Sentence (43') violates the Maxim of Quantity (and presumably the Maxim of Relevance), because the description renders the anaphora sentence of (43) completely trivial and uninformative .

There are two reasons behind the failure of **P5** rules in these cases. The first is that the rules generating the representations are unable to capture the variability and richness resulting from interaction with the context. This is expressed in the impossibility to rightly state the restriction of the pronoun taking into account the intuitions of the speaker. The second reason is that while logical maximality—the basic feature of **P5** and **D-T** rules—is a plausible constraint imposed on accessible domain anaphora, it is too rigid and coarse to deal with inaccesible domain (or across discourse) anaphora.

Since our primary purpose in this essay has been to show that donkey sentences are nonspecific in nature and, therefore, basically underdetermined by context, the limitations mentioned above cannot be welcome. Fortunately, at least two options are available to us to overcome them. One could, for instance, modify the previous rules so as to introduce more contextual information into the restricted set structures and weaken, thereby, logical maximality. Although this looks in principle a workable idea, we will adopt here a more comprehensive alternative. We will abandon the GQ theory (and its restricted set reflection) and formulate the functional D-type analysis in a different representational language: that of Discourse Representation Theory (DRT; see Chapter One, Section 1.3). There is a good reason to think that this option is not as radical as it might seem, namely: the conception (although not the treatment) of the quantified NPs is basically the same in both DRT and GQ theory. Consideration of two aspects of this conception makes it clear. First, definition of quantifiers. DRT defines, as GQ theory does, quantifiers as expressing a particular relation between sets.[26] Second, plural nouns. DRT's analysis of plurals is based on Link's analysis, which, as we saw, underlies the

[26] See Kamp and Reyle (1993, pp. 314 ff.).

FGQ account of donkey anaphora.[27] These aspects, accordingly, allow us to retain without a major change the idea of nonspecific reference implemented in the previous chapter.

On the other hand, the important difference between DRT and FGQ relates, obviously, to their approaches to donkey anaphora. DRT defends a binding account of donkey pronouns; GQ theory excludes this account in principle because of its commitment to the E-type analysis. Nevertheless, important as this difference might be, it does not seem to be a crucial one. As it has often been shown in the literature, DR structures can successfully be combined with E-type treatments, provided such treatments are implemented in functional terms and, therefore, binding mechanisms are blocked or dismissed.[28] We think that, given the sketchy character of our proposal here, the reasons above should suffice to justify our substitution of the present GQ language for the DRT language.

One question remains to be asked, nevertheless, and that is: Why should we prefer DRT to any other competing theories in order for the functional conception of donkey anaphora to embrace intersentential cases? The motivation behind favouring DRT is twofold. First, DRT comes, as we saw in Chapter One, with a context-orientated notion of meaning. Central to that notion is the idea that the basic unit of meaning is the discourse rather than the sentence and that the content of a sentence is better explained as a function from discourse meanings to discourse meanings. This conception of meaning provides in its turn a basis for explaining donkey nonspecificity as the result of processing donkey sentences by speakers through discourse. Consequently, according to this explanation, the interpretation of a discourse involving donkey sentences can only take place once each sentence and the anaphoric linkages incorporated by them have been processed with respect to the previous discourse.

[27] Kamp and Reyle (op.cit., pp. 401 ff.)

[28] See for example Heim (1990), and Chierchia (1992, 1995).

Our second reason for choosing DRT is that it agrees with our conceptualist view about representations. On the one hand, a DR structure (or DRS) is, as Kamp and Reyle point out, a "partial information structure," since it will assert the existence of only a small portion of the totality of individuals we suppose exist in the domain of discourse and specify "only some of the properties and relations of those individuals [it] mention[s]".[29] Thus a DRS may leave it open whether or not two individuals in the same domain stand in a certain relation. Models, in contrast, as Kamp and Reyle emphasise, "leave no relevant information out". In this particular sense, DRSs may be characterized as "partial models".[30]

From a mentalistic point of view, on the other hand, they may be understood as specifying cognitive or informational states that the discourse recipient forms when he/she reconstructs verbal messages. A DRS will specify, in such a case, some of the components of real cognitive states of recipients like, for instance, belief states and presuppositions. It does so by specifying that "the belief that ϕ, for instance, has a structure homomorphic to the DRS derived from ϕ and a content that is at least as detailed" (Asher 1993, p.65). This representational conception matches quite nicely with our cognitivist arguments in favour of referential nonspecificity. If nonspecific referents or denotations are conceived as a sort of cognitive entity or construct that recipients (and speakers) are mentally committed to when processing donkey anaphora in natural language, their cognitive states should reflect that commitment. The representations of these states should, therefore, help us to specify how such a commitment occurs in verbal communication. DRSs can perform this task quite successfully, which provides, it seems to us, a final motivation for preferring DRT to other alternatives.[31]

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[29] Kamp and Reyle (1993, p. 97).

[30] See Asher (1993, p. 10); of course, this interpretation of DRSs is not mandatory. They could also be considered as structures that are themselves interpreted by means of some mapping to sets of standard models. In which case, DRSs will be sets of constraints on the models that interpret the sentences represented by DRSs.

[31] For detail on other philosophical motivations supporting DRT see Asher (1993, pp.63–6) and Kamp and Reyle (1993, pp. 7–13)

We are in a position to discuss more technical issues. For the sake of simplicity, we will assume a minimal familiarity with the 'boxes language' of DRT. Boxes language allows us to graphically represent the meaning of different quantified sentences. Thus, the representation that DRT generates for our paradigm donkey sentence example, repeated here as (44), is (45).

(44) *Every man*$_1$ who owns a donkey beats *it*$_1$.

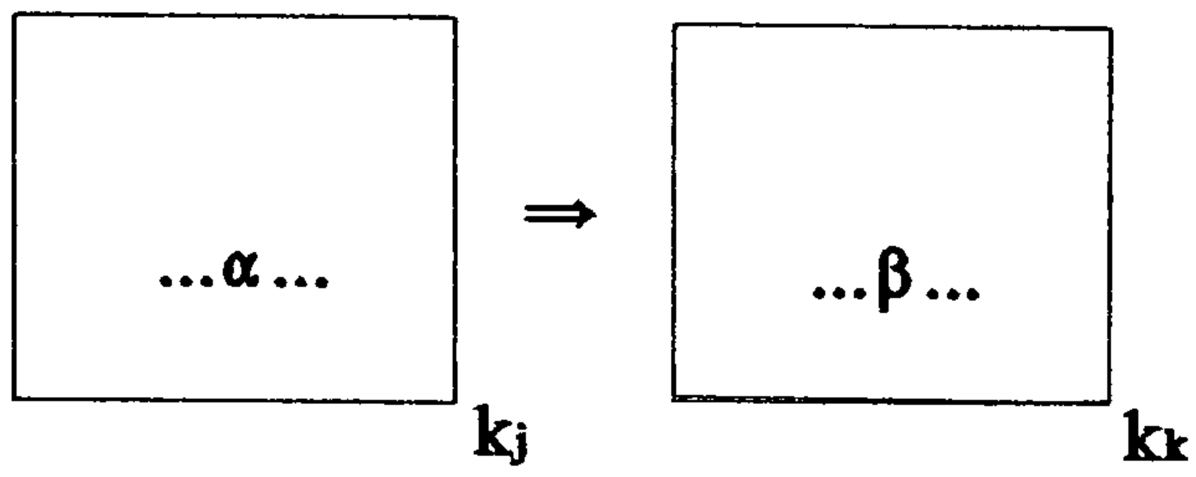
(45)

x y man (x) donkey (y) owns (x, y)	⇒	w beats (x, w) w = y

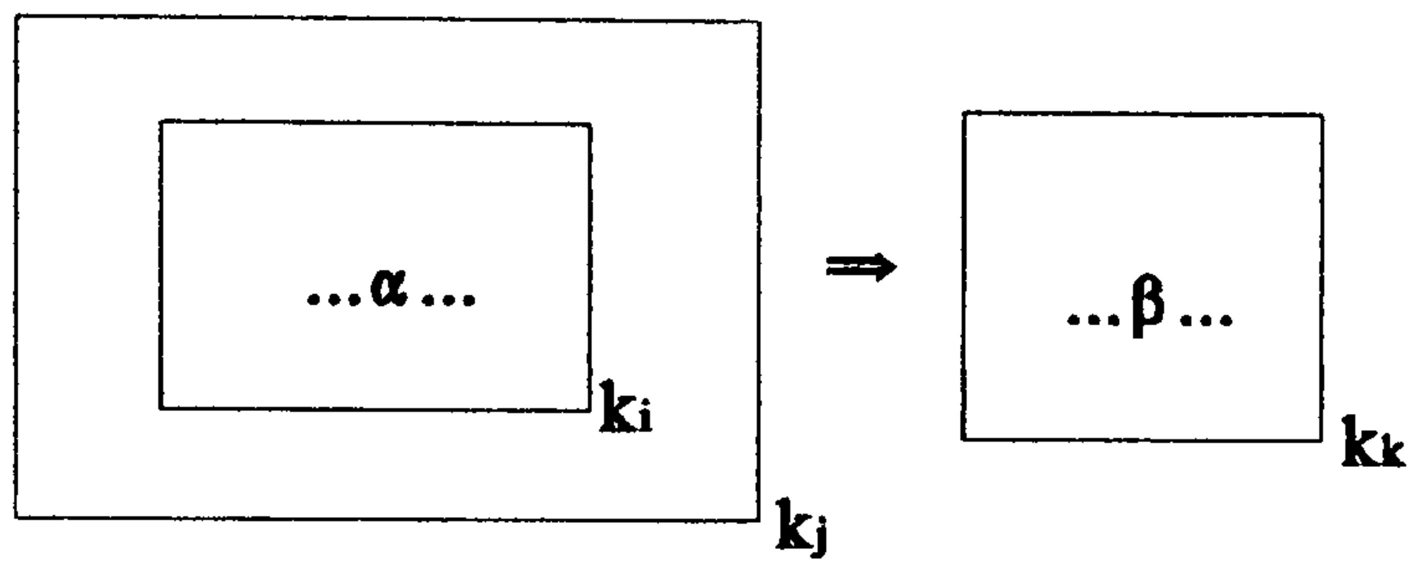
As we know, indefinite descriptions, pronouns and names introduce ***discourse referents*** into the DRSs, which are variable-like entities. Thus, 'x', 'y' and 'w' indicate discourse referents in the so-called minimal boxes. These referents have atomic conditions on them such as 'Donkey(y)', or 'Man (x)' which must be satisfied by appropriate assignments of values. Identities of the type "y=x" in minimal boxes represent anaphoric relations. Sentential operators like *if ...then...* or others introduce a complex relation between different minimal boxes. Also, the determiner *every* and the conditional operator introduce in DRS the same complex condition on minimal boxes. They generate therefore the same DRSs. Given these assumptions, the representation of (44) will contain a tripartite structure formed by two minimal boxes and an operator, as shown in (45).

An important requirement about acceptability of anaphoric linkage in DRT is ***accessibility***. This requeriment is specified in structures (46) and (47) below. In (46), the discourse referent α in the minimal box K_j is accessible to the discourse referent β. In contrast, in (47) α is not accesible to β because α is embedded in the minimal box K_i which is, in turn, ***subordinate*** to the non-minimal box K_j (in conditionals, the righthand box, which represents the consequent, is subordinate to the lefhand box, which represents the antecedent).[32]

(46)



(47)



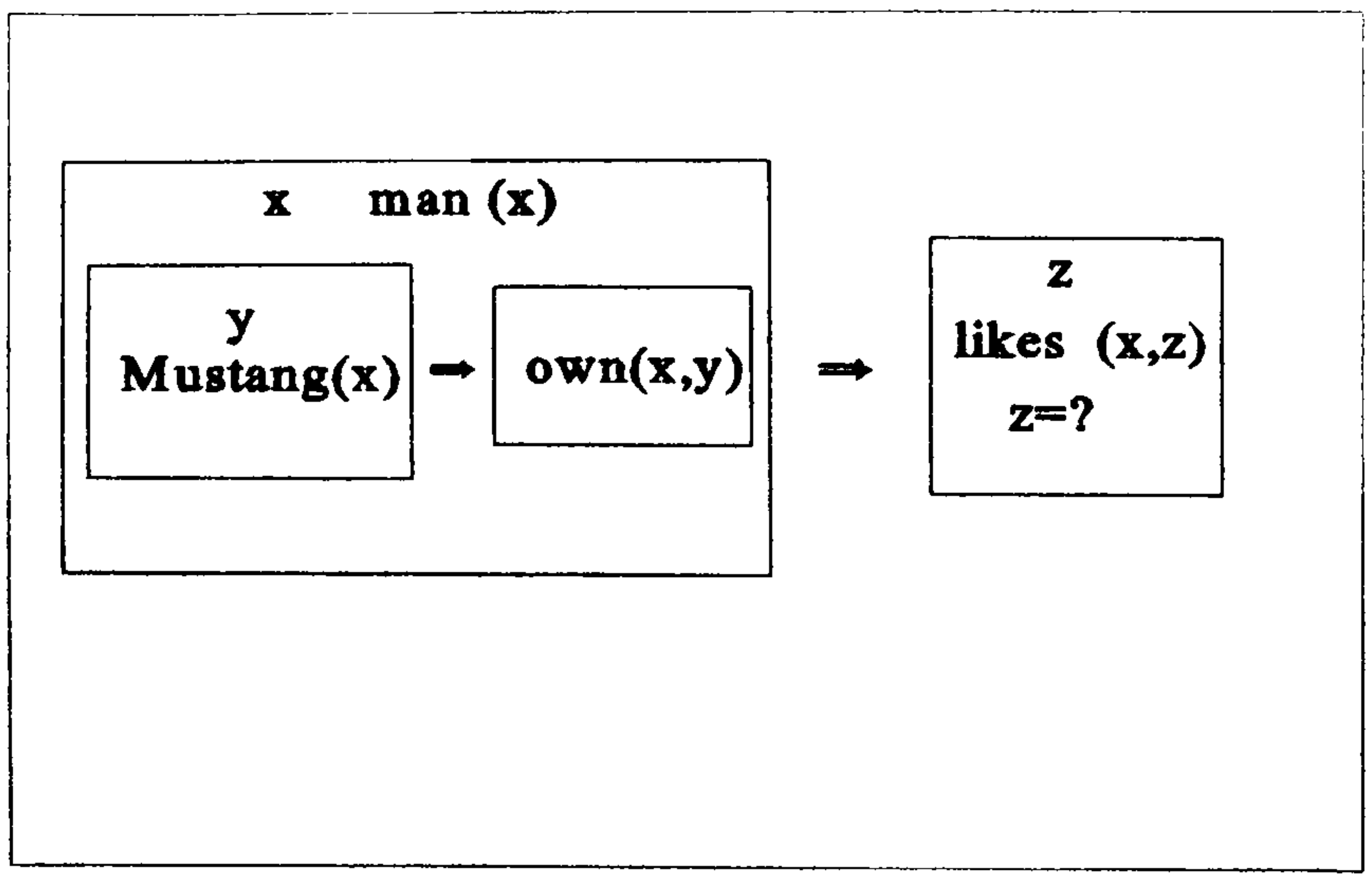
The accessibility constraint allows us to explain the unacceptability of anaphoric linkage in sentences like (48) and (49).

(48) * Every man who owns every Mustang$_i$ likes it$_i$. (Asher, 1993)
(49) * Every man who owns a Mustang$_i$ praises it$_i$. It$_i$ runs very well.

Let us examine sentence (48). It generates DRS (50), where the discourse referent 'y'—the potential antecedent of 'z'—is clearly inaccessible to 'z', because 'y' occurs in a minimal box embedded in a non-minimal box to the left of the box containing 'z'.

[32] For a formal definition of these notions, see Asher (1993).

(50)



Given that the non-minimal lefthand box in (50) has the same structure as DRS (45), it follows that all intended antecedents of the pronoun in the righthand box of (50) will be inaccessible to it. This consequence entails that classical DRT is strongly committed to Heim's Scope Constraint, discussed in previous chapters, which states that the scope of quantifiers cannot extend beyond the clause in which they occur in S-structure. We will come back to this later.

Sentences like (48) and (49) are unacceptable though, similar examples expressing inaccesibility, like sentence (51), are perfectly acceptable.

(51) If Sophie has bought *a book*$_1$, she will be home reading *it*$_1$. *It*$_1$ will be a spy-thriller.[33]

Roberts (1987, 1989) has labelled the accessibility problem of sentences of the form (51) (which incorporates modalities in its anaphora sentences) the ***modal subordination*** problem. She has offered an interesting solution to it, the "accommodation of the missing antecedent" approach. Her solution for interpreting the pronoun in the second sentence of (51) consists in the "pragmatic accommodation of a contextually given hypothetical common ground [from] the antecedent of the modally subordinated clause" (Roberts 1987, p.23). "To accommodate" means here to add a presupposition to the contextual

33 Properly speaking, the pronoun in the second sentence of (51) is an instance of E-type but not donkey anaphora.

knowledge, or common ground, shared by all participants in the process of verbal communication.[34] Without the introduction of that presupposition, Roberts argues, we could not make sense of the utterance of a sentence or a discourse. Technically speaking, Roberts' accommodation strategy consists in the following: the presence of a modality (*will* or others) implies that an anaphora sentence expressing modal subordination must be interpreted according to an epistemic (or causal) context. This context is created by updating a lefthand DRS of the sentence with the information in the lefthand DRS derived from the immediately antecedent sentence.[35] In (51), for instance, the auxiliar *will* in both anaphoric sentences allows us to introduce a link between our knowledge of Sophie and, say, her behaviour with the spy-thrillers she owns.[36] So, our intuitive understanding of the anaphora sentence seems to require the repetition or 'recopying' of the antecedent in the successive sentences containing the E-type pronoun and modal subordination. So, we generate the following DRS for the two sentences of (51)—where the epistemic or causal link is basically represented by the small box '□'.

[34] The notion of 'common ground' is defined by Stalnaker (1979).

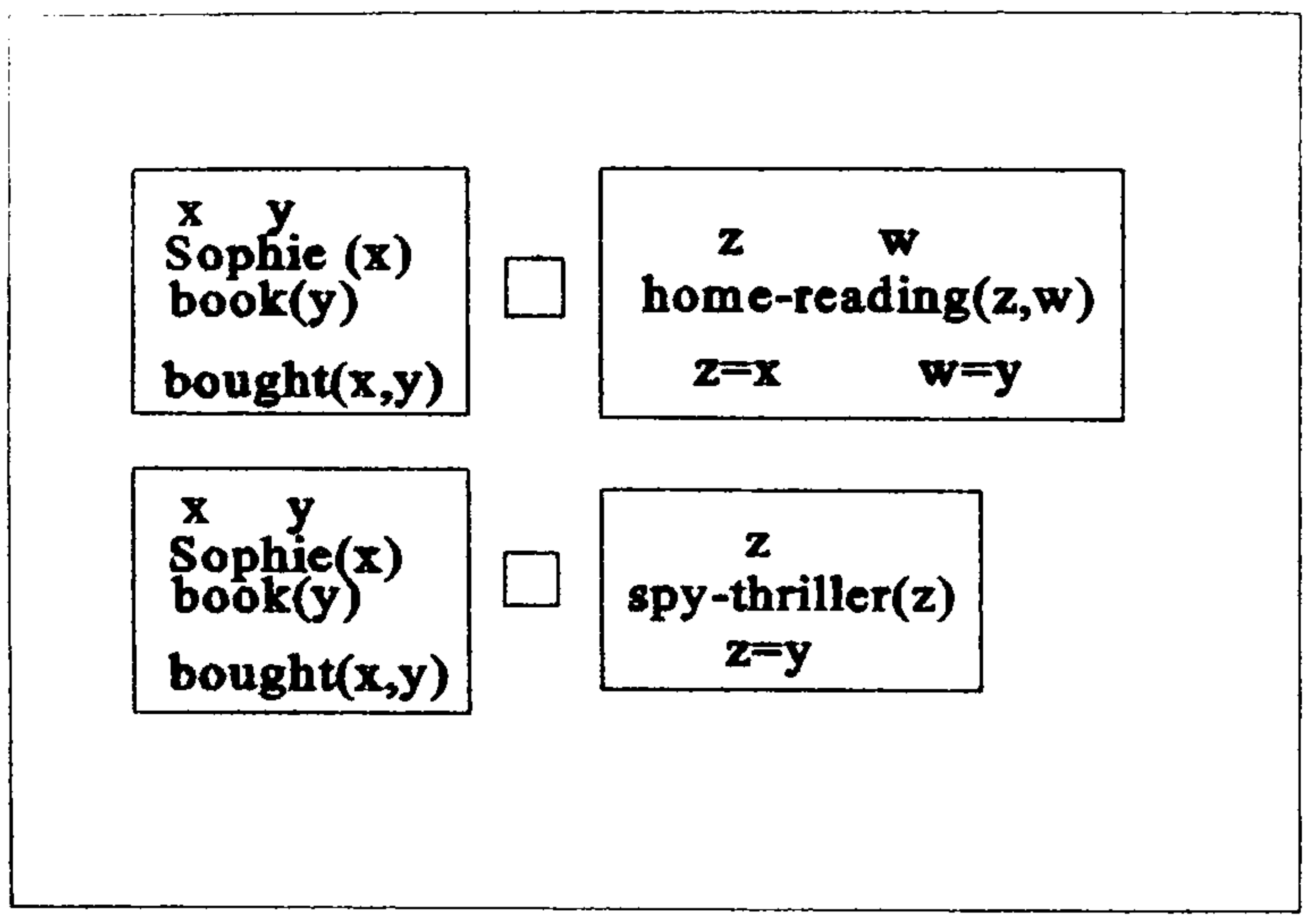
[35] This applies only to donkey pronouns anaphoric on subject NPs in the antecedent sentence.

[36] Examples of modal subordination are closely related to problems of specification by hearers in verbal communication. Consider the following example discussed in Karttunen (1976).

(i) Mary wants to marry a rich man_1. He_1 must be a banker.

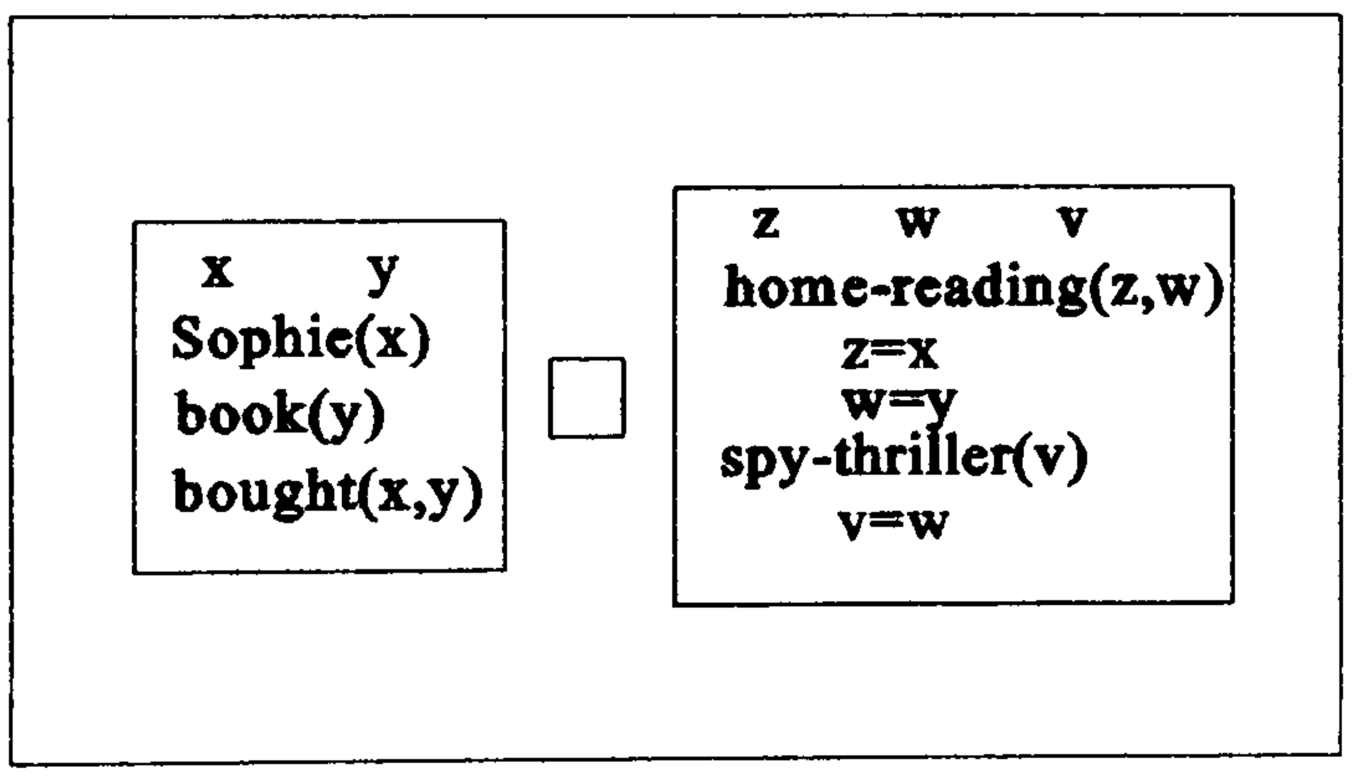
Sentence (i) has two possible readings, a nonspecific and specific reading. That is, a reading where the hearer assumes that there is still no specific individual whom Mary is considering marrying, and the specific reading where the hearer assumes that this individual exists. The modal continuation in the anaphora sentence is perfectly acceptable in both cases. In particular, it is acceptable (for the hearer) to continue to elaborate anaphorically on the atributes of an as yet unspecified individual. This suggests that (modal or non-modal) intersentential donkey anaphora can be seen as a complex phenomenon deriving from different uses of descriptions and nonspecific reference. This is a phenomenon clearly underdetermined by the cognitive states and beliefs of the hearer.

(52a)



Together with the accommodation approach, Roberts discusses another alternative to deal with (51), which she calls the "insertion approach". Therein, the semantic information coming from the anaphora sentence(s) is directly inserted into the righthand box generated by the complex condition *if... then....* The insertion approach generates therefore the following representation for (51).

(52b)



Roberts concludes, based on modal considerations that need not be examined here, that the insertion approach is defective and that the accommodation approach should be preferred. It is worth noting however that, despite her criticism of the insertion solution, Roberts does not take a definitive stance on it or on the accommodation approach.[37]

37 See Roberts (1987, pp. 21-26). This vaccilation, however, affects the motivation to apply either approach in non-modal cases of subordination, as we shall see later—this fact is also noticed by Barker (1997). Since Roberts does not formulate any constraint to specify which approach applies to which case, one must conclude that such applications will depend on context and pragmatics.

Roberts and others[38] have argued that the accommodation (and insertion) approach could be extended to non-modal cases of intersentential donkey anaphora. We shall assume, without further discussion, that this option is basically correct. The most positive aspect of non-modal accommodation is that it provides us with a general account of intersentential E-type and donkey anaphora. According to this account, the processing of donkey pronouns by recipients is an activity of rational reconstruction, that is, of reconstructing, in a wide sense, the restriction of the pronouns, by appealing to context and common ground information. Thus, donkey pronouns embedded in discourse, can be associated, under certain constraints, with particular restrictors or restrictive DRSs. We can then explain in a straightforward way other cases that violate accessibility, for example, telescoping cases. Sentences (53)–(56) provide some examples of telescoping.

(53) Each degree candidate$_1$ walked to the stage to receive his diploma. He$_1$ shook hands with the dean and left. (Roberts 1987)

(54) Every farmer owns a gun. He keeps it in a safe place. (Ludlow1994)

(55) Each candidate for the space mission meets all our requirements. He has a PhD in Astrophysics and extensive prior flight experience. (Roberts 1987)

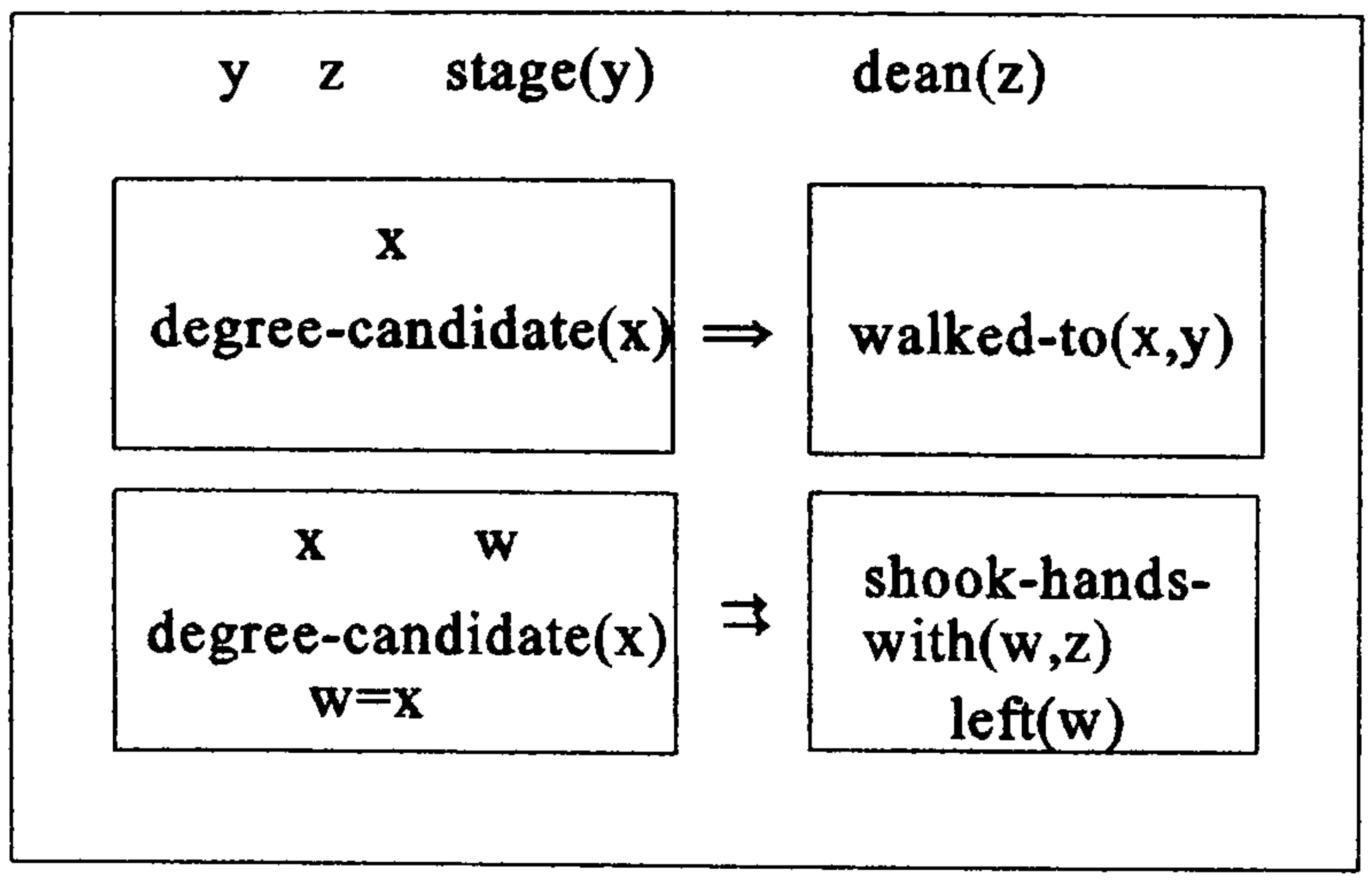
(56) ? Every dog$_1$ came in. It$_1$ lay down under the table. (Poesio and Zucchi 1992)

Let us take sentences (53) and (54). Roberts's accommodation account provides the following DRSs for them—where the restrictive pronoun-antecedent connection is expressed by the special conditional operator '$\rightrightarrows$'.[39]

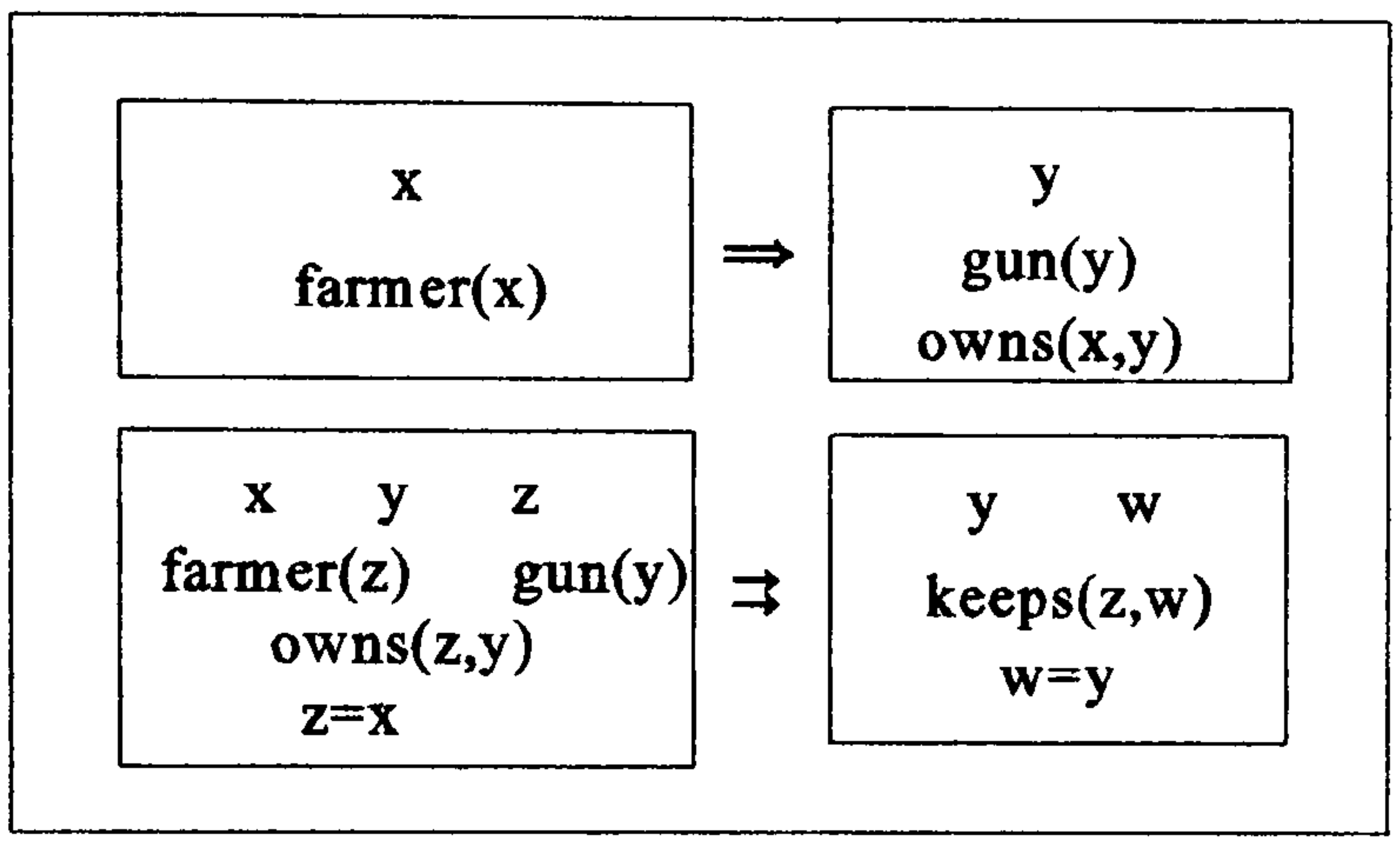
[38] For example, Asher (1993).

[39] In fact, Roberts proposes to treat (53) by means of insertion; see Roberts (1987, p. 38). We follow here rather Asher's (1993) and Barker's (1997) treatments. On the other hand, these treatments do not exclude completely insertion, since they imply that when antecedents of unbound pronouns are in the *consequent-DRS* (the righthand box) they must be accommmodated in the box of the restrictor too. And this has a clear effect of insertion towards the lefthand box in the complex condition associated with the anaphora sentence. Sentence (54) and its DRS in (54') are a simple example of this effect.

(53')



(54')



It is now clear that if one accepts the non-modal accommodation solution, the problem of accessibility that (53)–(56) pose to DRT and other approaches endorsing the binding view is adequately solved. That is to say, the solution matches DRT constraints without violating the Scope Constraint. Nevertheless, as Poesio and Zucchi (1992) have convincingly argued, if we assume the accommodation approach then we are left with an important methodological problem. This is that accommodation does not provide any explanation of the contrast in acceptability between (53)–(55) and the following examples:

(56) ?Every dog$_1$ came in. It$_1$ lay down under the table.
(57) *If every cat$_1$ purrs, it$_1$ is happy.
(58) *If John owes every man$_1$ money then Sam pays him$_1$.
(59) *John likes every dog$_1$ but Sam feeds it$_1$.

Telescoping sentences (56)–(59) could be handled by the accommodation approach though, they are semantically unacceptable. Poesio and Zucchi have suggested that, while the basic idea behind non-modal accommodation is essentially correct (i.e. to reconstruct the telescoped pronouns as restrictions on discourse referents), the approach supporting it fails to explain the contrast in question because of the narrow pragmatic basis underlying the reconstruction process. They argue that in order to explain telescoping sentences, it is necessary to appeal to a wider conception of the pragmatic environment that surrounds the utterance of those sentences. According to them, the acceptability of sentences (53)–(55) depends on seeing them as instantiating routines or sequences of events, in which each member from a contextually-given group instantiates a certain property. Apparently, (56)–(59) cannot be associated with these articulated sequences of events or routines and, thereby, reconstruction of the restrictor yields implausible results for these sentences. Evidence in favour of this hypothesis, according to Poesio and Zucchi, comes from the fact that some initially unacceptable telescoping sentences become marginally acceptable, given an appropriate context. It is the case, for instance, of (56). The following routine, they claim, makes telescoping marginally acceptable in that sentence.[40]

> I went to the circus last night. They had a number involving dogs that went like this: The circus performers put a table on some supports. Then, every dog came in. It lay down under the table, stood on its back paws, and lifted the table with its front paws. (Poesio and Zucchi 1992, p. 360)

They proceed then to formulate a set of conditions that license restrictor reconstruction. These conditions should determine when telescoping becomes plausible; that is, when the discourse and the context allow a sentence S to be interpreted relative to a restrictor R. The general conditions are the following (see Poesio and Zucchi 1992, pp.349–50):

(A) The discourse can make it clear that a sentence S is to be interpreted relative to a

[40] They call these sequences of events 'salient scripts'; see Poesio and Zucchi (1992, p.350).

restrictor R by explicitly indicating via syntactic means the presence of an operator which takes a restrictor and a nuclear scope.

(B) The discourse can make it clear that a sentence S is to be interpreted relative to a restrictor R by providing contextual information which links S to a restrictor.

As a consequence of (A), (B), and the discussion about routines above, Poesio and Zucchi formulate the following principle:

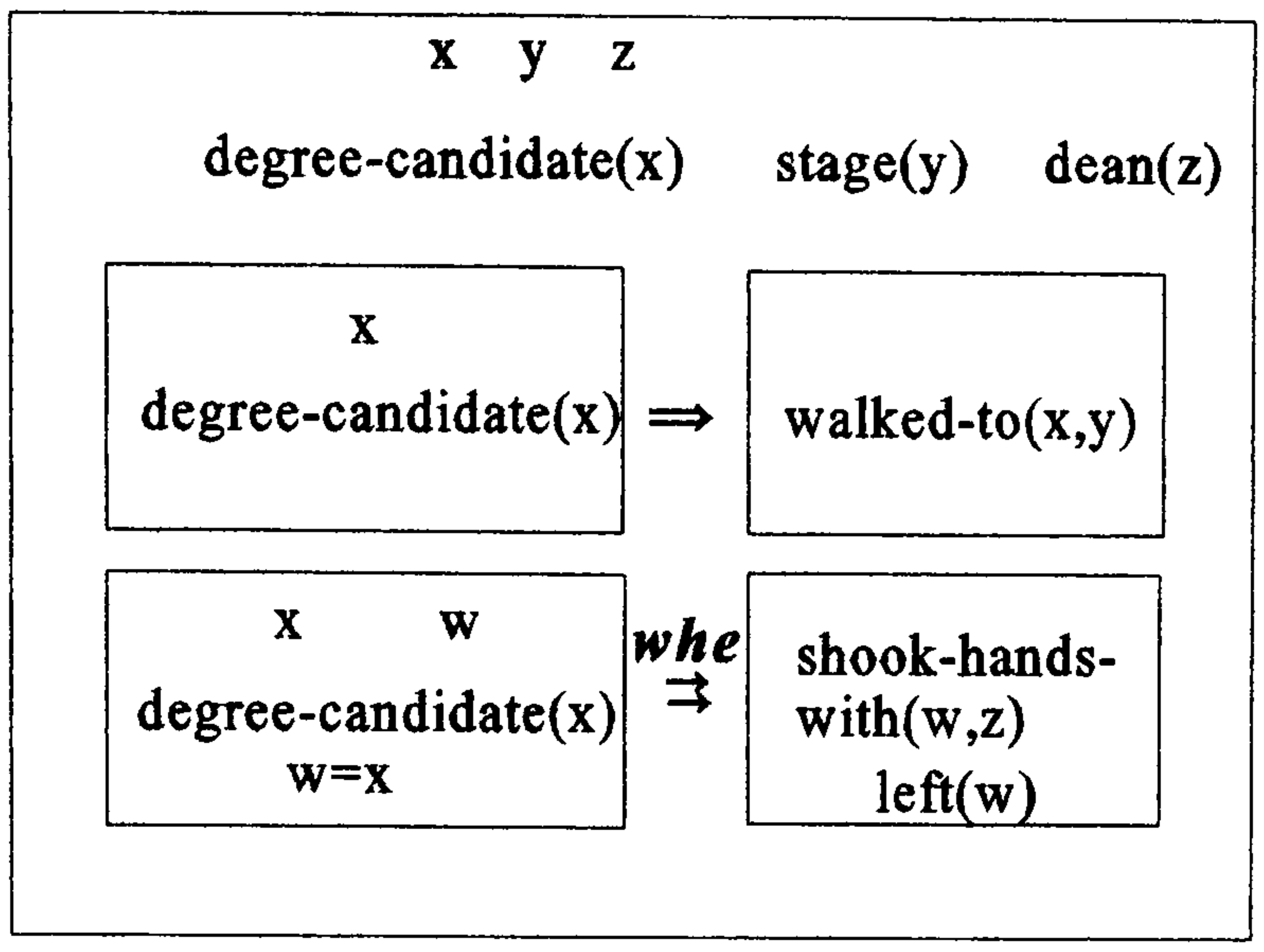
(PZP) A context c may link S to a restrictor $[\alpha]$ only if $[\alpha] \Rightarrow S$ is a step of a routine salient in c.

Finally, their theory also offers an interesting connection with Neale's E-type analysis, which will enable us to treat E- or D-type pronouns as restrictors across discourse. This is possible because Neale's theory satisfies in general conditions (A) and (B). Concerning condition (A), Neale's rules are clearly sensitive to restriction and scope construals, (see Chapter Three). Concerning (B), the nature of E-type pronouns and the Gricean constraints that, according to Neale, are operative in the interpretation of such pronouns, allow one to check whether or not an E-type pronoun is potentially available as restrictor in discourse. This agrees, as Poesio and Zucchi notice, with Neale's opinion that cases like (56)-(59) above—i.e. discourses containing pronouns anaphoric on *every* phrases that do not c-command them—can pragmatically but not semantically be ruled out (Neale 1990, p.232). The aforementioned connection between Neale's theory and theirs is not pursued further by Poesio and Zucchi. Since the study of such a connection may shed some interesting light on the problems with maximality discussed earlier, the last part of this section will be dedicated to exploring it in some detail.

Given that Neale's theory licenses the construction of restrictors, these can, in a DRT scenario, be treated as restrictive DRSs satisfying (A) and (B). To begin with let us consider structure (60), which represents sentence (53). In (60) we have introduced the operator *whe*, which, as Neale explains, has the force of a universal quantifier without uniqueness restrictions. So it can be interpreted as a pronoun-antecedent restrictor satisfying the property '$|\mathbf{F}\text{-}\mathbf{G}| = 0$ & $|\mathbf{F}| = \geq 1$'.

(53) Each degree candidate$_1$ walked to the stage to receive his diploma. He$_1$ shook hands with the dean and left. (Roberts 1987)

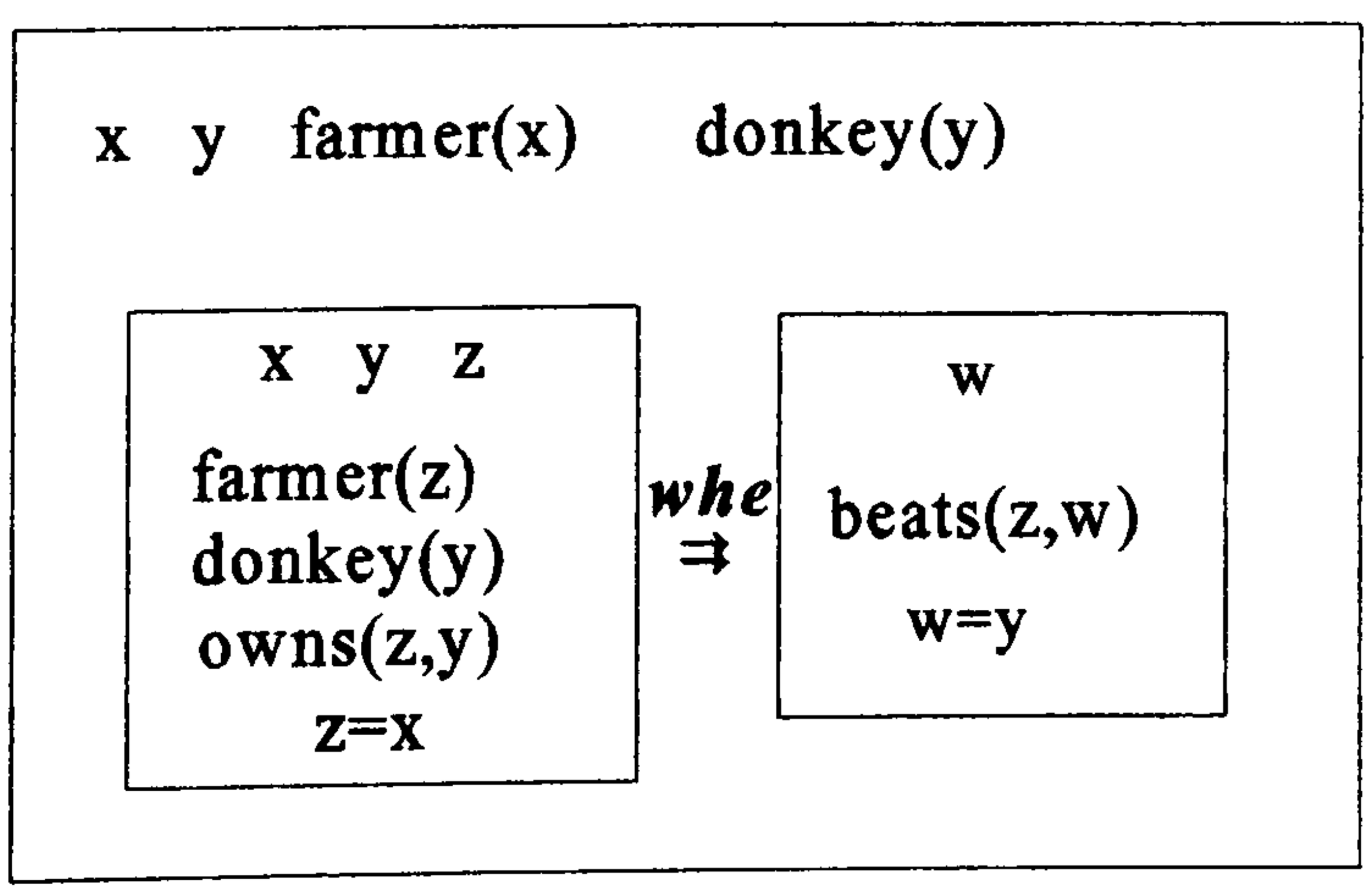
(60)



Structure (60) assigns the right truth-conditions to (53). Finally, this theory enables us to show that unmodified donkey conditionals can also be treated as telescoping cases. A standard example is (61). The pronoun *he* in its anaphora sentence can be represented as in (62). Furthermore, examination of DRS (62) makes it clear that its truth-conditions are the same as those of DRS (45) above.

(61) If a farmer owns a donkey, he beats it

(62)



Our proposal needs at this point to answer the following question: How could the functional treatment of donkey anaphora be introduced in a restrictive DRS containing the *whe* operator? (It should be noticed in any case that the answer we are going to offer is not necessarily a rival to the one based only on Poesio and Zucchi's principles). Let us introduce the first details of our view by using the simple donkey conditional in (61). The problem there concerns the anaphora sentence (the consequent sentence). Our functional representation of the pronouns in this sentence is specified in (63) (we do not use composite functions in what follows).

(63)

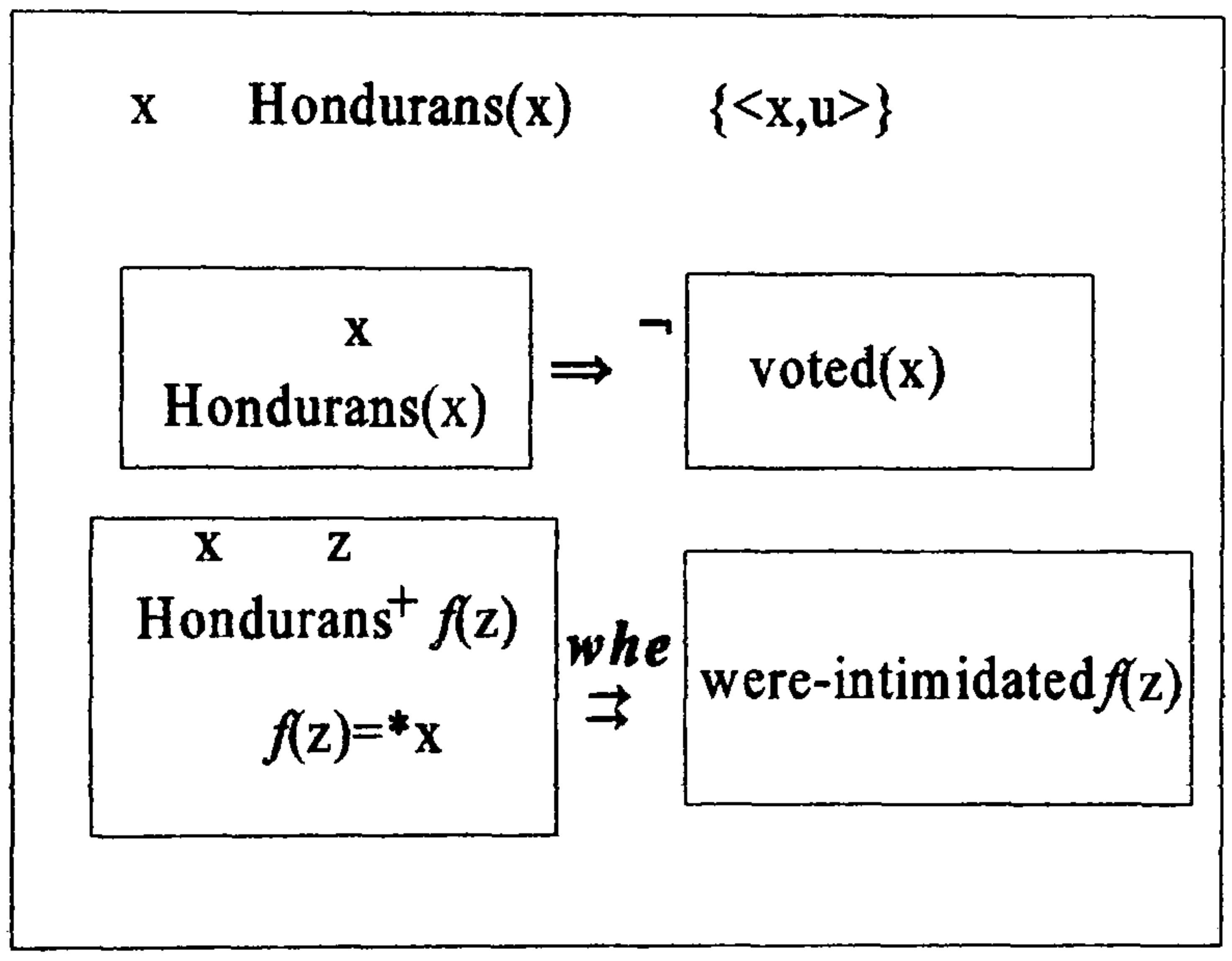
<table>
<tr><td colspan="3">x y farmer(x) donkey(y)
{<z,u>}</td></tr>
<tr>
<td>x y z
farmer(z)
donkey(y)
owns(z,y)
z=x</td>
<td>whe
⇉</td>
<td>f(z)
beats(z,f(z))
f(z)=*y</td>
</tr>
</table>

It is clear enough that (63) parallels (62) because the former is obtained by replacing in the latter 'w' and 'w=y' with '*f*(z)' and '*f*(z)=*y' respectively. This implies, firstly, that '*f*(z)' should be interpreted (within the restrictor box) as an individual variable only. Secondly, that makes it clear that the expression '*f*(z)=*y' does not stand for the assignment of a value to '*f*(z)', but only for the already stipulated DRT anaphoric condition that relates a pronoun (the function) to its antecedent (the individual variable). In following the common practice in DRT, we chose to indicate the assignment of a value to a function outside the restrictor by means of ordered pairs of the form '{<x,u>}', where 'x' stands for the argument of the function and 'u' for its value. Thus, the ordered pair in (63) is '{<z,u>}' because the function in question in the restrictor is '*f*(z)'. This allows us to assign (outside the restrictor box) a direct reference (the value 'u') to the pronoun.[41]

Putting aside other minor modifications, it is now easily checked that the truth-conditions that (63) assigns to the anaphora sentence of (61) coincide with the ones assigned by (62). That is, (63) implies that the farmers (or the farmer) who own(s) a donkey beat(s) the donkey or donkeys they (he) own (s). Now we check those cases where Neale's rules and functional rules failed, i.e. cases like (42) and (43). For example, the problem with sentence (42) can now be handled in an E-type functional account with *whe* restrictors. This is shown in (64), the DRS of sentence (42).

(42) No Hondurans$_1$ voted. They$_1$ were intimidated by the secret police.

(64)



Structure (64) shows that we deal with (42) as we did with (53). Therefore, the pronoun *they* in the anaphora sentence is interpreted in the lefthand box as a function whose domain is provided by the common ground, in accordance with (A), (B) and (PZP). The range, in its turn, is determined via accommodation. Thus, the restrictor *whe* specifies

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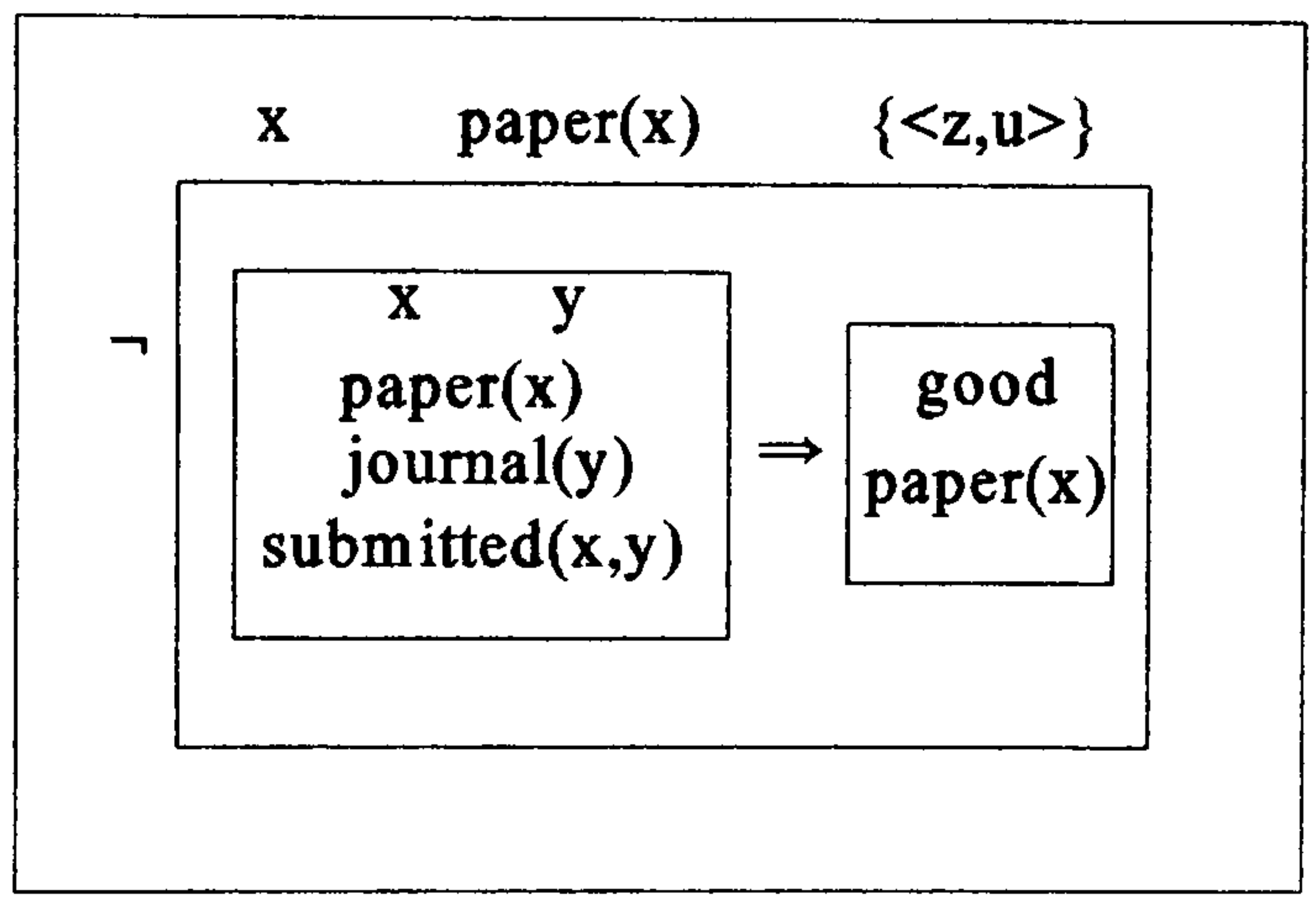
[41] More specifically, '{<z,u>}' in the minimal box of (63) corresponds to what is called in DRT an *external anchor*, which describes the argument and the value of a partial function *f* associated with a discourse referent in the representation. External anchors in DRT are mechanisms intended to supply direct reference to discourse referents in the minimal boxes and dispense, thus, with conditions on proper names. Since donkey functions are directly referential expressions, it is possible to treat them as external anchors as well. See Kamp and Reyle (1993, p.246-8) and Asher (1993, pp.82-4).

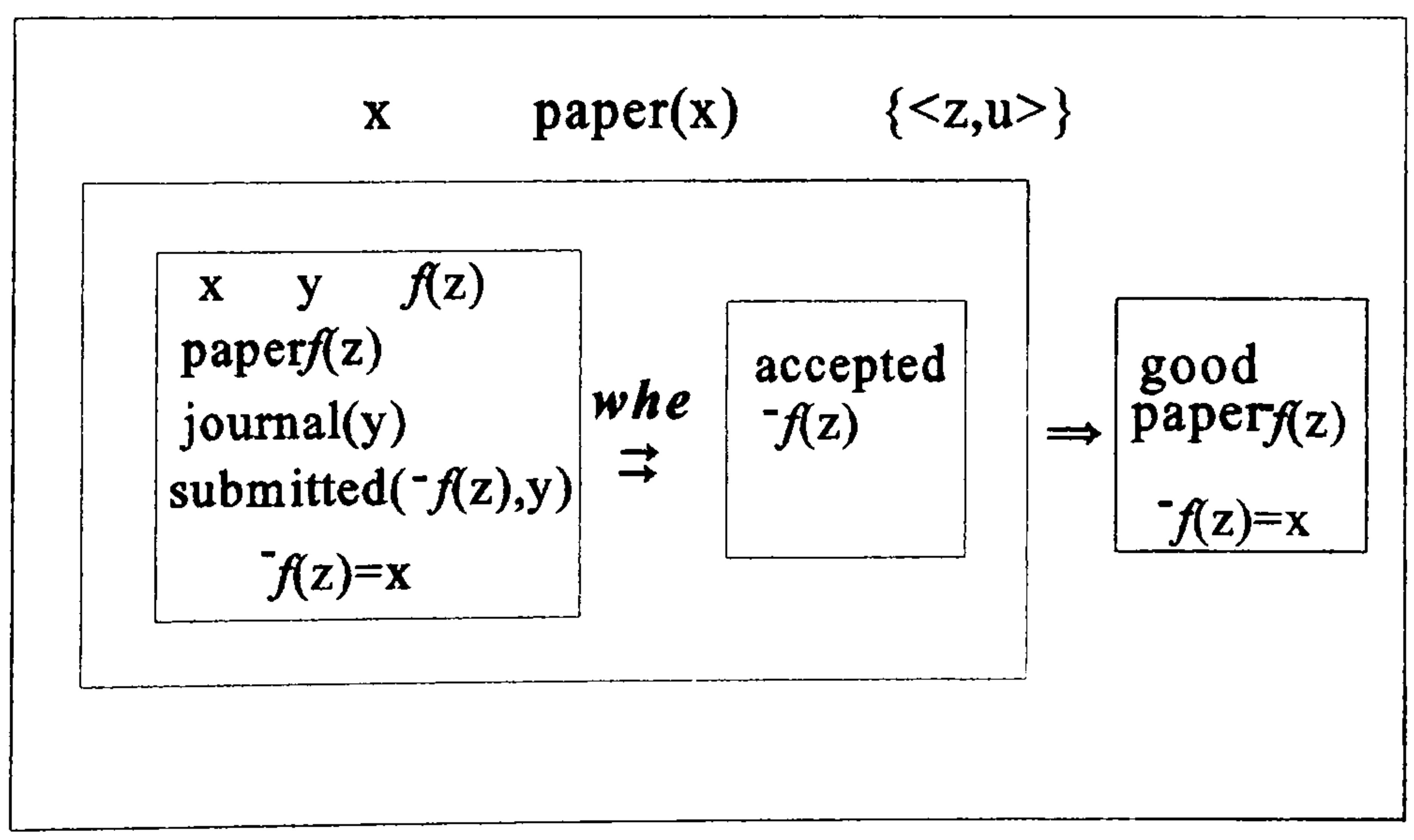
that the pronoun is limited to only *the Hondurans*, and ensures the acceptability of the translation of the pronoun as a plural definite description. In the function itself, this is indicated by the maximality condition '+'. Furthermore, the anaphoric relation in sentence (43) can now be similarly treated using *whe* restrictors. Structure (65) yields the representation of the antecedent sentence of (43) from which we derive by accommodation the representation of the anaphora sentence of (43) in (66). The sole accommodated material in the restrictor of (66) is provided by the antecedent DRS in (65). Moreover, the function in the restrictor of (66) is a choice function, which is indicated by the symbol '–'.[42]

(43) Not *every paper*$_1$ that gets submitted to a journal is a good paper. If *it*$_1$ is accepted, *it*$_1$ is a good paper.

(65)



(66)



[42] In order to meet the constraints imposed by Roberts on accommodation, representation of the negation in structures (64) and (65) will presumably need further elaboration. See Roberts (1987, pp. 29–30)

Since we are now going to examine other more complex cases we need to enlarge on the functional account so as to incorporate some explicit constraints on restrictor reconstruction. These constraints will motivate, in their turn, the formulation of recovery rules for donkey functions in restrictive DRSs.

On the basis of the above discussion, the following constraints on the reconstruction of restrictors associated with donkey pronouns can be suggested.

(C) Considerations of consistency, plausibility and informativeness governed by Gricean Maxims should determine what is accommodated in the restrictor (Ludlow 1994, Poesio and Zucchi 1992).

(D) The semantic structure of the preceding discourse plays a role beyond affecting salience in constraining accommodation (Poesio and Zucchi 1992)

(E) The pronoun and its intuitive antecedent are formally related, but this relation is not necessarily realised as variable binding. The relation consists in the individuation, using semantic material coming from the antecedent discourse, of certain functions by means of appropriate recovery procedures and the application of pragmatic constraints (B), (C) and (D) above.

Condition (C) is self-explanatory and, given our previous discussion about sentences (56)–(59), clearly acceptable. Condition (D) is formulated by Poesio and Zucchi (1992) in order to rule out a purely pragmatic reconstruction of the restrictors.[43] This is what the explanation of the contrast between sentences (43) and (67) seems to require.

(43) Not *every paper*$_1$ that gets submitted to a journal is a good paper. If *it*$_1$ is accepted, *it*$_1$ is a good paper.

(67) ? Not *every paper*$_1$ is written in Spanish. If *it*$_1$ is submitted to an English journal, the editors do not like *it*$_1$. (Poesio and Zucchi 1992)

[43] See Poesio and Zucchi (1992, pp. 351-3).

The pragmatic reconstruction of the pronouns works well on (43) by dismissing material in the VP of the antecedent sentence—i.e. *is a good paper*. It cannot however be applied to (67). In Poesio and Zucchi's words "the pragmatic story predicts that we should understand [(67)] as saying what [(67') below] says. In fact, [(67)] cannot get reading [(67') below]. English speakers find [(67)] bad since the only reading available, given in [(67") below], doesn't make much sense" (Poesio and Zucchi 1992, p. 353)

(67') Not *every paper*$_1$ is written in Spanish. If x is a paper written in Spanish and x is submitted to an English journal, the editors do not like it.

(67") Not *every paper*$_1$ is written in Spanish. If x is a paper submitted to an English journal, the editors do not like it.

Condition (E) contains our view about donkey anaphora. Since (E) involves an interaction between recovery rules for donkey functions and pragmatic constraints in a DRT setting, it is not easy to see how it could be implemented. Undoubtedly, a fully worked out approach to this problem should go well beyond the boundaries of this dissertation. However, we believe an initial version of the recovery rules can be adequately grounded if work is done in accordance with Poesio and Zucchi's constraints on accommodation of discourse markers in restrictors. Poesio and Zucchi (1992, p.353) suggest the following general principle for accommodating descriptive information:

(P1) *Accommodate descriptive material from the minimal box containing the accommodated discourse marker up to inconsistency or implausibility.*

The 'descriptive material' in **P1** is determined by the same sort of knowledge that prompted (C) above: that is to say, knowledge yielded by the common ground. As is obvious, **P1** is intended to impose (the most) general conditions on the interpretation of a pronoun associated with a discourse marker in a minimal box. Furthermore, Poesio and Zucchi formulate a rule in order to specify which particular information can be accepted in a restrictor. It is the following:

(C1) *If a discourse marker x is accommodated in a restrictor r, only descriptive material* *in the minimal box whose universe contains x can be accommodated in r.*

Thus, **C1** has the effect of specifying the correct choice of restrictors and therefore the direct interpretation that the pronoun gets from the minimal box containing the discourse marker (anaphorically connected to the pronoun). On this basis, we would like to sketch a possible version of recovery rules for *whe* restrictors in a DRT setting. Of course, no one of our previous arguments hinges on the eventual success of such rules.

The first rule allows us to specify the domain of a donkey function on the basis of an expansion of **P1**. It is the following:

(D-TACdom) The domain of a donkey function $f(x)$ anaphorically associated with a discourse referent 'y' in a minimal box K_j is determined by the knowledge of the common ground that can be accommodated in the universe of the first minimal box K_{j-n} containing 'y', up to inconsistency or implausibility.

The crucial rule to recover the range of the functions of telescoped pronouns is obtained on the basis of an extension of **C1**. It is the following:

(D-TACrg) The range of a donkey function $f(x)$ anaphorically associated with a discourse referent 'y' in a restrictor R_j (the minimal box K_j) is only the semantic material accommodated in R_j coming from the first minimal box K_{j-n} whose universe contains 'y'.[44]

Armed with these rules, we will examine a telescoping case that Neale's semantics cannot

[44] In order to complete the functional account, something like a rule to recover the range of non-telescoped E-type functions supplied with *whe* restrictors should be formulated. The rule below is offered as a first attempt. The rule assumes that a non-telescoped E-type pronoun is represented by a function occupying a position within minimal boxes, which are not restrictors themselves.

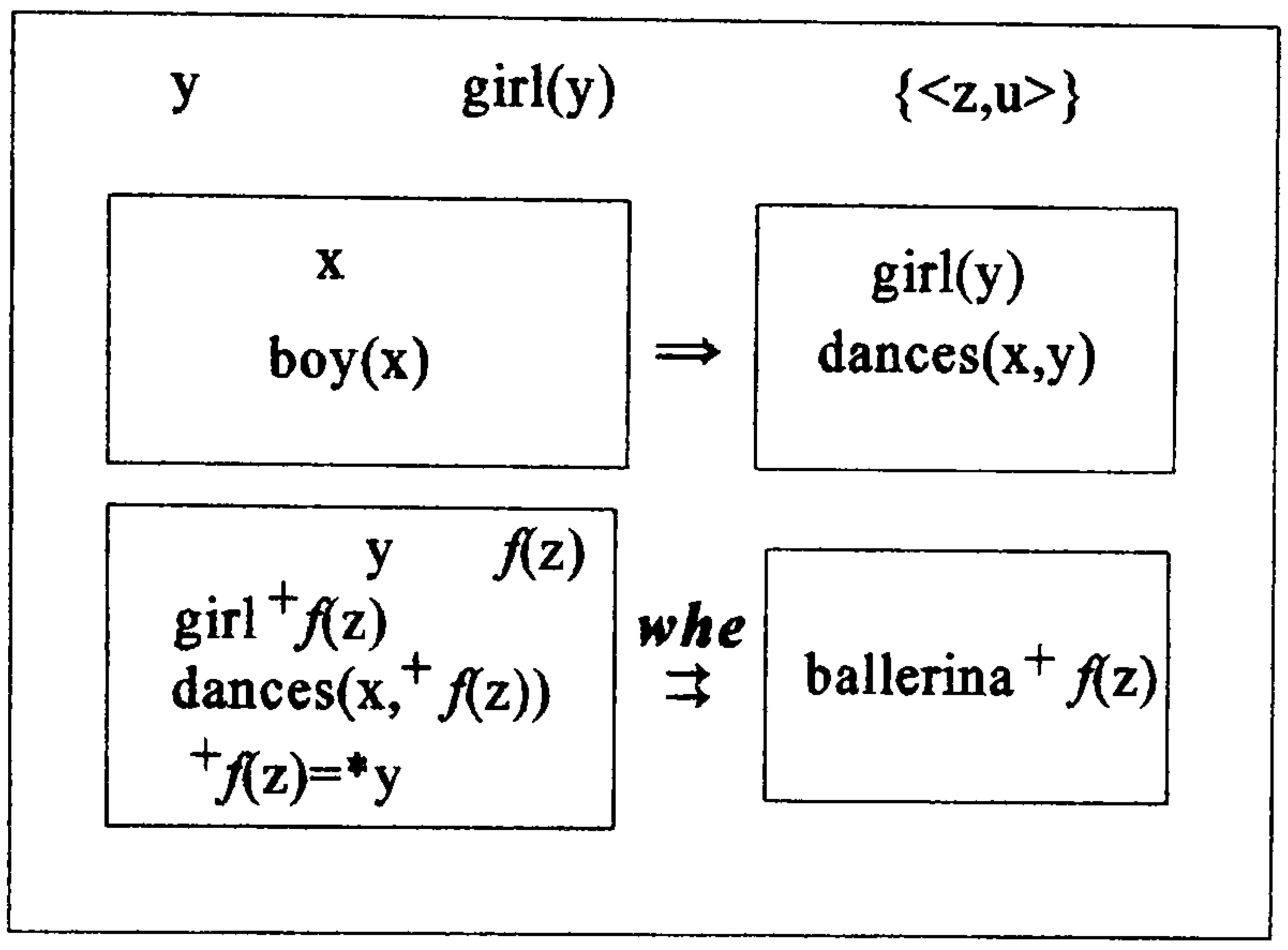
(D-TACrg') The range of a donkey function $f(x)$, in a minimal box K_j that is not a restrictor R, anaphorically associated with a discourse referent 'y' is only the semantic material accommodated in the first restrictor R_{j-n} (the minimal box K_{j-n}) whose universe contains 'y' or '$f(x)=*y$'.

handle adequately (see Section 3.4). The case is (68) below:

(68) Every boy danced with *a girl*. *She* was a ballerina. (Neale 1990)

Let us focus on both the representation of the restriction that accommodation attributes to the sentence (68) and the interpretation of the function embedded in the restrictor. The representation in question is (69).

(69)



Representation (69) shows how the range of the function 'ƒ(z)' in the restrictor of the anaphora sentence is recovered by using **D-TACrg**. If the first minimal box whose universe contains 'y' consists of the righthand box of the DRS of the antecedent sentence in (68), the accommodated semantic material related to 'y' is *the girl(s) who danced with somebody*. To be sure, this is not the interpretation we would expect from processing the anaphora sentence. As Neale points out, we would expect something like *the girl(s)who danced with every boy*. In the account presented here at least two options are available to solve this problem. The first consists in showing that the anaphoric linkage in the sentence (68) is pragmatically unacceptable. This involves demonstrating that (68) does not satisfy the PZP principle. We think that this alternative is attractive and likely to match the intuitions of many speakers. It might be useful however to consider how the functional account of *whe* restrictors would work if (68) turned out to be acceptable as we believe it is. Our suggestion to carry out the last is as follows. Let us look at conditions (C) and (D) above. It can be argued, for example, that since the antecedent sentence has been already processed, the description *the girl(s) who danced with somebody* violates at least Grice's Maxim of Quantity. This description is not informative enough because we know already who the girl danced with. Nevertheless, according to condition (D), this additional information can be derived from the antecedent sentence, since the semantic material therein indicates that every individual in the domain satisfying the condition 'boy(x)' danced with the individual satisfying the condition 'girl(f(z))' in the restrictor. What we get, as a result, is not just the accommodation but rather the full insertion of the semantic material of the antecedent sentence in the restrictor, as shown in (70). Structure (70) assigns the correct truth-conditions to the anaphora sentence of (68).

(70)

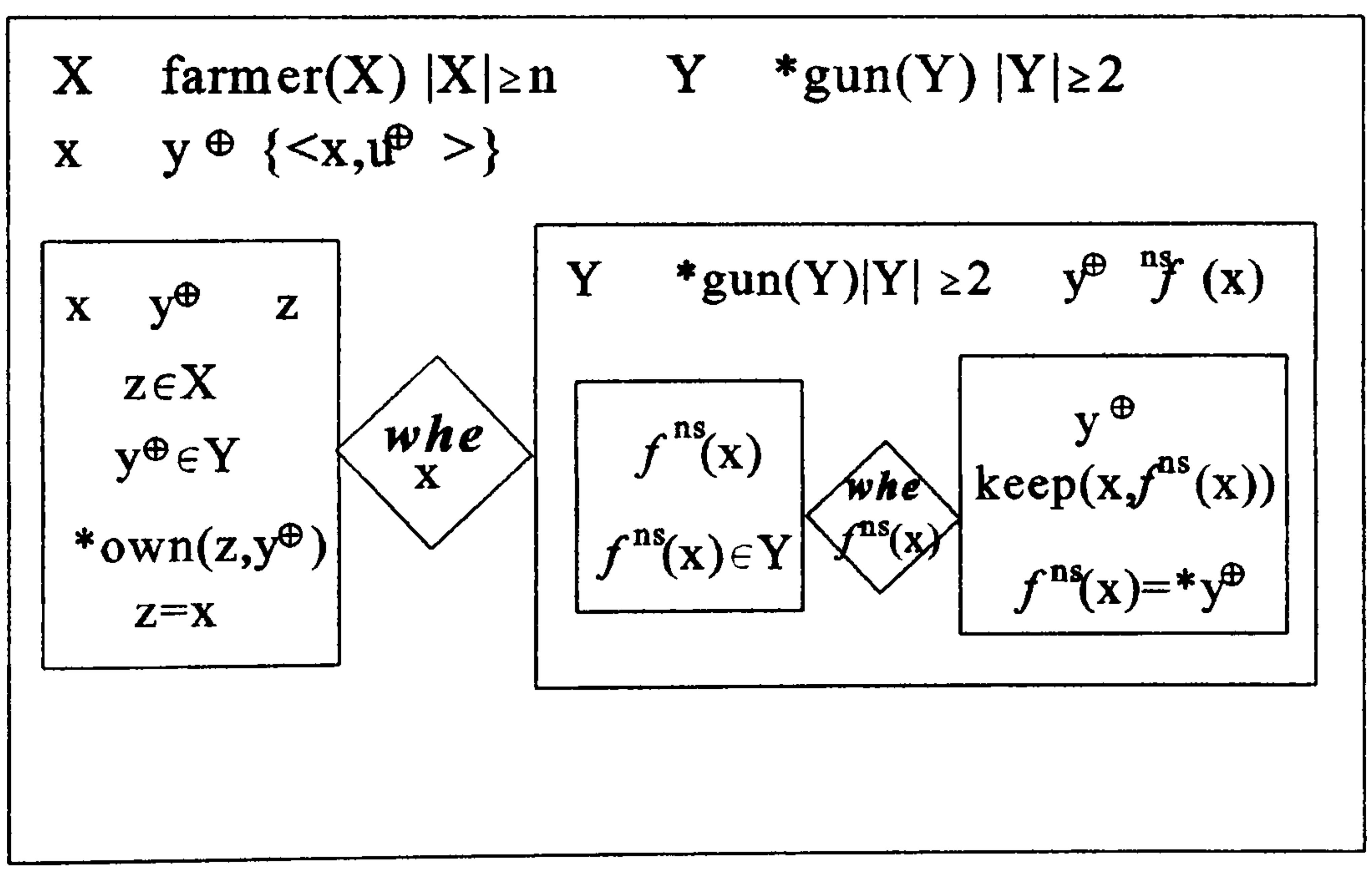
$$\boxed{\begin{array}{ccc} \text{y} & \text{girl(y)} & \{\langle \text{z,u}\rangle\} \\ \boxed{\begin{array}{c} \text{x y } f(\text{z}) \\ \text{girl }^{+}f(\text{z}) \\ \text{boy(x)} \\ \text{danced-} \\ \text{with (x,}f(\text{z})) \\ f(\text{z})\text{=y} \end{array}} & \overset{\textbf{\textit{whe}}}{\rightrightarrows} & \boxed{\text{ballerina}^{+}f(\text{z})} \end{array}}$$

Finally, what about nonspecificity in this new picture? Generally speaking, all our remarks about donkey functions and restrictors apply to nonspecific values (the values assigned to such functions) because of the semantic framework supporting DRT, as we saw at the beginning of this section. Accordingly, a general theory of *whe* restrictors can provide a basis for a more systematic formulation of the nature of the donkey functions and their nonspecific values. We will suggest here how this could be done with a quite simple example, the sentence (71).

(71) Every *farmer*$_1$ owns *two guns*$_2$. *He*$_1$ keeps *them*$_2$ in a safe place.

Following Kamp and Reyle's (1993) treatment of plurals, we will introduce sets as discourse referents and represent all sets containing **i**-sums (or nonspecific values) with the symbol '*', as usual. All **i**-sums or nonspecific individuals will be associated with the symbol '$^\oplus$'. Moreover, we stipulate, following Lappin and Francez, that the second argument (the object NP) of the two-place predicate '*R(x,y)' is a nonspecific value (or **i**-sum if you like). Finally, Kamp and Reyle's 'duplex condition' notation for representing generalized quantifiers is incorporated here;[45] they are represented by diamond-shaped boxes. Thus, under the collective reading of the pronoun *them* in (71), the functional *whe* restrictors theory generates the following representation for the anaphora sentence of (71).

(72)



Application of the particular constraints on plurals implemented by Kamp and Reyle's account and careful examination of the righthand box associated with the '*whe x*'

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[45] A duplex condition is a DRS with a general tripartite form constituted by two standard DRSs linked by a diamond-shaped box. The left DRS is the restrictor of the duplex condition, the right one is its nuclear scope and the diamond-shaped box is its quantifier. For more detail on duplex conditions see Kamp and Reyle (1993).

restrictor show that there may be two ways of interpreting the function '$f^{ns}(x)$', depending on which box we choose in the complex condition corresponding to the restrictor '*whe* $f^{ns}(x)$'. We can choose the box containing '$f^{ns}(x) \in Y$' and thus the function will be interpreted according to what **D-TACrg** stipulates. But also Kamp and Reyle's constraints allow us to choose in the complex condition the box containing the expression '$f^{ns}(x) =^* y\oplus$'. In such a case, the interpretation will presumably go along the lines stipulated by the rule **D-TACrg'** in footnote 44 above. In both cases however the first minimal box containing '$y\oplus$' in its universe and determining the range of '$f^{ns}(x)$' will be the lefthand one associated with the '*whe x*' restrictor. We obtain therefore in both cases the description *the nonspecific value or **i-sum** of at least two guns owned by a man*, just as it should be.

Appendix I

A definition of dependent domains for a FGQ approach of E-type anaphora.

The basic idea is to represent storage of E-type information across discourse by using a particular function **f**. **f** is a partial function from contextual variables of the form '[: F_1x & ...& F_kx]'—in short [x]—to formulae of the form '[Du:ϕ](ψ)'. General dependency between two contextual variables is then defined as follows (see van der Does 1996):

a. For [x],[y]$\in$Dom(**f**), [x] *depends on* [y] (in **f**) iff there are variables $z_1, \ldots, z_n \in$ Dom(**F**) with z_n=x, y=z_1, and [z_{i+1}]$\in$Rg(**f** (z_i)).

Dependency between range and domain of donkey functions can then be defined as follows:

b. For [f(x)],[g(y)]$\in$Dom(**f**), [g(y)] *depends on* [f(x)] iff [y] depends on [x], [z_{i+1}]$\in$Rg (**f**(f(z_1))) and Rg(**f**(f(z_1))) $\subset$ Dom(**f**(g(x))).

Appendix II

Union of functions

Example:

(1) Every boy who has a dog_1 and every girl who has a cat_2 will beat $\text{it}_{1,2}$ (Chierchia 1995)

(1') $\exists^{\neg/+}\zeta$ { [[[$\exists$B:|B|$\geq$n] [($\forall$x)x$\in$B]] ([[$\exists D^{ns}$:| D^{ns} |$\geq$1][($\exists$y)y$\in D^{ns}$]] (*Hxy))] $\rightarrow$
((∀c)(*B(c, $^{\neg M+}\zeta^{ns}$(c))))] & [[[$\exists$G:|G|$\geq$n] [($\forall$x)x$\in$G]]
([[$\exists C^{ns}$:|C^{ns} |$\geq$1][($\exists$y)y$\in C^{ns}$]] (*Hxy))] $\rightarrow$ ((∀c)(*B(c, $^{\neg M+}\zeta^{ns}$(c))))] }

We interpret 'ζ' in (1') as a functional meta-variable which represents the union of two donkey functions. Each function will map the argument c from one of the two possible domains into one of the two possible ranges. The specification of 'ζ' and its eventual domain and range is given below.[1]

(1") $\ ^{\neg M+}\zeta^{ns}(c) = \ ^{\neg M+}f^{ns}(d) \cup \ ^{\neg M+}g^{ns}(e)$

(1' a) $^{\neg/+}f^{ns}$ = domain: boys who have dogs
range : the maximal nonspecific compound of dogs (with cardinality of at least 1) that boys in the domain have.(x **D-Trg b**)

(1' b) $^{\neg/+}g^{ns}$ = domain: girls who have cats
range : the maximal nonspecific compound of dogs (with cardinality of at least 1) that girls in the domain have. (x **D-Trg b**)

E- and subject asymmetric readings

Example:

(2) Usually if a person$_1$ has a credit card$_2$ he$_1$ pays his bill with it$_2$.

We state first the FGQ simplification of (2) and then its restricted set version. It should be clear from both versions that the pronoun *it* in the anaphora sentence of (2) denotes a choice function *g*. (2"a) and (2"b) specify the domain and the range of each function.

(2') $|\ \{s: \{x: \text{Person}(s, x)\} \cap \{a: \{b: {}^*\text{has}(s, a, b)\} \cap \{y: \text{1\_credit\_card}(s, y)\} \neq \varnothing\} \neq \varnothing\} \cap \{s': \{c: {}^*\text{has}(s', {}^{+}f^{ns}(s', c), {}^{-}g^{ns}(s', {}^{+}f^{ns}(s', c)))\}\ | > 50\%$
$|\ \{s: \{x: \text{Person}(s, x)\} \cap \{a: \{b: {}^*\text{has}(s, a, b)\} \cap \{y: \text{1\_credit\_card}(s, y)\} \neq \varnothing\} \neq \varnothing\}\ |$

(2") $\exists^{+/\neg}f\ \exists^{+/\neg}g\ \{\{[[\exists P{:}|P| \geq 1][(\exists x)x \in P]]\ ([[\exists C^{ns}{:}|\ C^{ns}\ | \geq 1][(\exists y) \in C^{ns}]]$
$([(\exists s)(s \in S^{ns})](\ {}^*Hxy,s)))\} \rightarrow \{[[\exists S'^{\ ns}{:}|S'| > 50\%\{S\}][(\exists s')(s' \in S')]]$
$((\forall c)(\ {}^*P(s', {}^{+}f^{ns}(s', c), {}^{-}g^{ns}({}^{+}f^{ns}(s', c)))))\}\}$

---

[1]This solution builds on a proposal by Chierchia (1995, pp. 116-7).

(2"a) **he** = ${}^{+}f^{ns}$ = domain : male human beings who have at least one credit card in a situation s.

range : the maximal nonspecific compound of male human beings (with cardinality of at least 1) who have nonspecific values of credit cards (with cardinality at least 1) in s'. (x **D-Trg b**)

(2" b) **it** = ${}^{-}g^{ns}$ = domain : the range of (2" a)(x **D-Trg c**).

range : the nonmaximal nonspecific compound of credit cards (with cardinality of at least 1) that the members of the domain have in s' . (x **D-Trg b**)

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